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Fort McMurray Athabasca Tar Sands Development Strategy

Prepared For The
Executive Council

By

The Conservation
and
Utilization Committee

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FORT McMURRAY

ATHABASCA TAR SANDS DEVELOPMENT

STRATEGY

Prepared for the

Executive Council

by the

Alberta Conservation and Utilization Committee

Edmonton, Alberta August, 1972.

SUMMARY OF OBJECTIVES

The basic premise is that the demand for synthetic crude oil is from markets external to Canada, consequently one primary objective and five secondary objectives are suggested:

1. Alberta should regulate and control the Athabasca tar sands development for the socio-economic benefit of Albertans.
2. The social benefits accruing to Albertans should be inherent in the development of the resource and the associated urban development.
3. The rate and direction of the development should be dependent on Canada's ability to participate economically and on Alberta's requirements for economic development.
4. The development should result in a net long term benefit and improvement to Alberta's physical and ecological environment.
5. The evolvement of tar sand technology should be led by Canadian technologists for the benefit of Canadians.
6. The development should be an integration of community, industry and government.

In suggesting these objectives there is an explicit recognition of the continuous requirement for balancing the concepts of "investor confidence" and "controlled development". Investor confidence must be maintained if the resource development is to complement and supplement the socio-economic development requirements of Albertans.

These objectives are used in projecting a development strategy which envisages a much slower rate of development than suggested by foreign markets. The orderly development rate is regulated by the first and third objective based on the basic premise. The rate of development of one plant in every four years is consistent with present technology and construction requirements.

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PREFACE AND ACKNOWLEDGEMENTS

The intent of this interim report is to indicate to Executive Council what initially appears to be some of the relevant issues for policy formulation. Although primary and secondary objectives as well as strategies are suggested to illustrate the direction of choice, the specific content of this strategic design will require considerable refinement to provide a firm policy framework within which detailed operational planning and implementation can take place. Because of its interim nature, the report is at best considered a "first approximation" which requires government response in order that those objectives and strategies acceptable to government can be further developed, those unacceptable can be modified and those rejected can be reformulated. Government response at this initial phase of the study is considered prerequisite to further in-depth analysis leading to a definitive strategy.

As a caution to the reader it should be pointed out that the objective of this report has been to initiate the process required to establish and implement a comprehensive development strategy for the bituminous tar sands of Alberta. At this initial phase of the process many questions have been raised but few have been answered. This study does not purport to present detailed answers to the complex problems and challenges confronting Albertans in connection with the development of the vast tar sands resource. Such detailed and costly planning should take place only after policies guiding the development have been established.

The Conservation and Utilization Committee gratefully acknowledges the contributions of those participating in the preparation of the Fort McMurray-Athabasca Tar Sands Development Strategy. It particularly

recognizes the contributions of the study component chairmen; Mr. H. W. Thiessen, Mr. A. F. Belyea, Mr. A. D. O'Brien, Mr. T. Cowan and Mr. C. Drabble. Recognition is also given to the co-ordinating efforts of the recording secretaries, Mr. B. Semeniuk and Mr. K. R. Smith. The following were participants in the study:

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1.0 INTRODUCTION

1.1 Definition of the Problem

The Ministers of the Environment, Industry and Commerce and Municipal Affairs requested the Conservation and Utilization Committee to conceptually explore the numerous ramifications of the bituminous tar sands development and suggest a comprehensive development strategy for discussion by the Executive Council.

This request was necessitated to overcome previous incremental and unco-ordinated operational planning undertaken by government agencies without continuous reference to consistent, common and articulated government objectives and policy. Although some elements of policy did exist as a result of the amended 1962 "Oil Sands Development Policy", part 6 of The Mines and Minerals Act and the various regulatory and operating procedures arising from the administrative functions of the Energy Resources Conservation Board and the Department of Mines and Minerals, there was no comprehensive policy which interrelated and integrated the bituminous tar sands development to the economic, social and environmental requirements of Alberta residents.

1.2 Objectives of Study

The objective of this study is to begin the process required to overcome the existing deficiency. Specifically the Ministers requested suggestions on:

(a) definition of objectives,

(b) delineation of an overall strategy,

(c) recommendations of a development control structure, and

(d) suggested time schedule of development.

1.3 Development Strategy Components

In order that a more meaningful understanding of the comprehensiveness of the development could take place, a systematic approach was adopted. Five basic subsystems or components were identified for detailed discussion and analysis preparatory to strategy suggestions. They consisted of the following:

(a) a social component which included those factors relative to health, education, work, recreation and cultural activities and the objectives and strategies leading to a satisfactory quality of life;

(b) an economic component which included the distribution of benefits and costs, maintenance of stability in the distribution of goods and services, diversification of development and the focus of economic activity beneficial to Alberta;

(c) an environmental component which included the physical and ecological ramifications of the development on the natural and human environment, the objectives and strategies which could be developed to ameliorate or obviate their impact or alternatively shape the impact to future advantage;

(d) a technical component which included the review of existing technology but emphasized the secondary and tertiary technologies for further industrialization and the impact of these technologies on the other components and those objectives and strategies required to complement other objectives;

(e) an administrative component which included the regional administrative, co-ordinative and political factors and the

appropriate objectives and strategies required to implement the overall strategy.

1.4 Direction of Choice

The development of the bituminous tar sands will undoubtedly shape the socio-economic destiny of Albertans to a far greater extent during the next century than the conventional crude oil developments have during the past several decades. Albertans have many options and strategies to consider and many decisions to make.

On one hand we can continue the policies of the conventional crude oil developments creating tremendous and unregulated growth and developments resulting in short term benefits accruing to the Province as well as the long term costs arising from exported energy, technology, job opportunities and environmental damages, in addition to the depletion of non-renewable resources.

Conversely we can regulate the orderly growth and development of the bituminous tar sands for the ultimate benefit of Alberta and Canada in order that Canadian technology will be expanded, Albertans will find beneficial and satisfying employment within its diversified economy, and our environment will be protected and enhanced for future use. But when the magnitude of the areal, fiscal and manpower requirements and environmental consequences are visualized, it becomes apparent that the latter course of action is imperative.

1.5 Development Potential Magnitude

The evaluated portion of the Athabasca deposit occupies about 5 3/4 million acres or roughly 100 times the surface area of Edmonton. The portion of the Athabasca deposit amenable to surface mining is 430,000 acres or roughly 7.8 times the surface area of Edmonton. The remainder of the reserves require in situ extraction processes.

The total heavy crude hydrocarbon in place in the Athabasca deposit is estimated at 626 billion barrels or about one third of the known world petroleum reserves. Of the 626 billion barrels in place, 267 billion barrels of upgraded synthetic crude oil are estimated to be recoverable.

Assuming an annual production rate of 1 million barrels per day (eight Syncrude sized plants), the following statistics and estimates provide some idea of the magnitude of such a development:

- Depletion of the resource would take approximately 734 years.
- The population increase would be approximately 80,000.
- Direct capital investment would be approximately $6 billion.
- Daily water requirements - 333 cfs - nearly 10% of the minimum monthly average flow of the Athabasca River.
- Approximately 6 acres of land will be disturbed daily, on average, by mining operations.
- Under the present proposals, owing to the delay required before tailings ponds can be reclaimed, the denuded area may reach as high as 20,000 acres before a balance between newly disturbed and reclaimed areas can be reached.
- The volume of waste being disposed to the tailings areas will be in the order of 2 million cubic yards daily, or an amount equivalent to about 17 Legislative Buildings.
- The sulphur equivalent of the SO_2 emissions would approximate 1950 Long tons per day.
- The total elemental sulphur produced would be 6600 Long tons per day or about half the 1971 Alberta production net.

2.0 POLICY OBJECTIVES AND STRATEGIES

2.1 Primary Objective

Alberta is not under any pressure to develop synthetic crude oil from the bituminous tar sands for the purpose of meeting either Albertan or Canadian petroleum requirements. The pressure to develop synthetic crude from the tar sands emanates from markets external to Canada.

Given the fact that the development of synthetic crude oil will be to meet foreign and not Canadian petroleum requirements, then the development of synthetic crude oil from the tar sands must proceed on a scale and rate of development which ensures that substantial benefits accrue to Canadians, and especially Albertans. In fact, these benefits must outweigh any future costs associated with the depletion of the non-renewable resource.

It is a basic premise of this study that substantial net long term benefits from the development of synthetic crude oil from the tar sands will be derived if, and only if, the development is firmly controlled in a manner which complements and supplements the development requirements of Alberta and Canada. It is also a basic premise that the demand for the synthetic crude oil will be sufficient to enable Alberta to control the basic terms and conditions for development.

Given this underlying philosophy, it becomes axiomatic that Alberta's primary objective should be to regulate, guide and control the bituminous tar sands development in order to meet the growing socio-economic needs of Albertans as well as Canadians; including the location, extent, upgrading, and processing as well as the secondary and tertiary developments induced by or stemming from the resource development.

This objective, however, must be weighed in respect to a variety of ambiguous or contradictory viewpoints. The anticipated rate and

direction of the development from a regional employment perspective dominated by a less skilled and unsophisticated indigenous work force may be far too slow from a broader provincial perspective. Conversely the provincial business sectors anticipation for a multitude of small to medium sized investment opportunities may be totally inconsistent from the perspective of the multi-national corporation and its massive investment plans. Furthermore, the provincial government's position of extending the life of the resource, simultaneous to the attraction of secondary industries to Alberta and using the resource potential as a bargaining lever will most certainly be inconsistent and in conflict with Canada's regional development policies or its apparent bias to maintain industrial and economic strength in central Canada.

The basic feature of the development model should be that the scale of development, rate of development and staging of development will be dictated by deliberate policy decisions by Albertans designed to ensure that the development complements and supplements the overall development requirements of Albertans and Canadians. The policy decisions should be guided primarily by the perceived benefits that will accrue to Albertans and Canadians. Only after Albertan and Canadian policy parameters have been fulfilled should foreign constraints become operative. In short, Canadian policy parameters should take precedence over all other factors. Foreign energy demands should not be the only force influencing development.

2.2 Secondary Objectives and Strategies

In addition there are numerous secondary objectives and strategies which require consideration in order to develop a comprehensive development strategy. These are described in relation to the five basic com-

ponents of the development strategy. These second order objectives are aggregated and general but sufficiently detailed to relate third order objectives in order to avoid inconsistency or ambiguity.

2.2.1 Social Objectives and Strategies

The objective with respect to the social or human component should be to encourage the opportunity for the development of individuals within their urban or industry oriented service center in such a manner that they may freely identify, participate and assimilate with their social and cultural environment in order that they may attain a satisfactory quality of life. This objective anticipates man's realization of the fullness of his human potential with respect to work and leisure and assumes societal structures are responsive to or congruent with changing needs and socio-economic conditions. It will require special emphasis on program activities relative to health, education, work, recreation and cultural activities to overcome initial responses to geographical isolation, single industry domination, climatic limitations etc.

It is not intended that the following listing of social strategies is complete or in any order of priority, but primarily a choice of alternative combinations to achieve our social objective.

2.2.1.1 Establishment of Fort McMurray as the primary service center for the tar sands development projects within a 50 mile radius and limiting proposed development approvals during the next 20 years to this geographic region.

2.2.1.2 Establishment of a Fort McMurray Regional Development Advisory Committee which would be representative of the public, industry and government in order that there would be an interchange of information between the

various groups to encourage co-operative involvement and participation during the planning and growth period.

2.2.1.3 Undertake research and planning for northern community development for Fort McMurray anticipating massive and rapid growth during the next 25 years.

2.2.1.4 Undertake research and planning for the movement systems required in the bituminous tar sands area, including all forms of rapid transit.

2.2.1.5 Planning and establishment of a manpower upgrading center which could be phased into a combination vocational training school and community college as the population expanded to train native and other workers, provide evening classes as well as vocational skills and academic courses.

2.2.1.6 Develop and construct the first phase of a hospital to service Fort McMurray and the surrounding northern region.

2.2.1.7 Plan and develop an integrated provincial government service center which would operate on the basis of providing all government services from one center. This should be phased over a period of years in order to stay abreast of population growth.

2.2.1.8 Develop a multi-purpose public awareness program which would emphasize the prospective developments and condition the local population, and place special attention on the native people in order to encourage their assimilation into the work force and overcome alienation. This latter emphasis could be accomplished in part by arranging short term contract work which the native worker could cope with and become accustomed to industry work habits. Another feature of this program would be to inform the Alberta public in order to obtain an orderly flow of construction and operational workers and condition them to their occupational

and geographic changes resulting in manpower stability.

2.2.1.9 Investigate the feasibility of developing regional air commuter service between Fort McMurray and other communities such as St. Paul, Bonnyville, Lac La Biche, Athabasca, Slave Lake, Wabasca, Peerless Lake, Fort Chipewyan and others all within the radius of approximately 175 miles in order that construction workers could live at home and commute in for a 3 day - 5 day work week. Many of these workers could be underemployed farmers, native people etc. who would not otherwise be available unless they uprooted their entire family.

2.2.1.10 Investigate the feasibility of developing a preventive industrial health service which would be oriented to special health hazards of the bituminous tar sands extraction industries.

2.2.1.11 Develop and implement a recreational and cultural program especially oriented to meet the diverse demands of a growing "one industry" community which would satisfy the needs of the entire family and of the single workers who move in for a time period and are separated from their homes.

2.2.1.12 Complete the upgrading and paving of Highway 63 in order to prepare for the increasing road travel and overcome in part the feeling of isolation.

2.2.2 Economic Objectives and Strategies

The economic objectives for bituminous tar sands development should be guided by the desire to control development while maintaining investor confidence. The basic economic objective should require that a favorable balance between economic benefits and costs be maintained from the public viewpoint; that economic diversification be associated with the development resulting in a stable and equitably distributed economy; that a balance be struck between the centralization and decentralization of

economic activity; that significant participation in the development by Alberta capital, labour and products be realized; that economic stability be maintained in all markets; and that future economic development alternatives remain available to Albertans.

A listing of some of the strategies which would complement the overall economic objective is given:

2.2.2.1 Commission consultants to develop a research study project which would measure the economic activity of the GCOS plant to the Canadian economy and the Alberta economy and determine the various economic parameters contributing to a viable benefit-cost analysis of the entire plant related operation.

2.2.2.2 Undertake the research of 2.2.2.1 in order that a basic understanding could be projected for a Syncrude sized plant with reference to the impact that it would have on the total economy.

2.2.2.3 Inventory the design construction and operation labour requirements, their cost and origin and ancillary services (taking into consideration modified technology) of the GCOS plant and project them for a Syncrude sized plant and determine the Canadian content deficiency for various classes of activity and technology and determine feasibility of overcoming the deficiency.

2.2.2.4 Inventory the materials, parts and equipment requirements, their cost and origin of the GCOS plant and ancillary services and project them (taking into consideration modified technology) for a Syncrude sized plant and determine the Canadian content deficiency for the various types of components and determine whether Canadian alternatives are available at present and at what cost differential, or whether they

could be economically manufactured in Canada.

2.2.2.5 Undertake research to determine the availability of investment funds in Alberta or Canada which could be channelled from the private sector into the tar sands development.

2.2.2.6 Undertake research into the concept of utilizing Alberta's public or quasi-public institutional investments to facilitate the financing of tar sands developments. If these funds or a portion thereof could be allocated to the tar sands development and if the same principle were applied to other similar institutions, considerable Alberta development capital could be generated for Alberta capital formation.

2.2.2.7 Investigate the feasibility of integrating an Alberta Resource Development Corporation with the Treasury Branches to funnel Alberta development capital into the bituminous tar sands development.

2.2.2.8 Investigate the feasibility of employing the Canada Development Corporation as a feasible alternative to 2.2.2.7.

2.2.2.9 Explore the ramifications of capital restrictions, labour restrictions, and material and equipment restrictions with the federal government with respect to international trade and commerce agreements, labour and immigration agreements, reciprocal trade and tariff agreements, etc.

2.2.2.10 Undertake an economic analysis of the petro-chemical processing, transportation and marketing economics with respect to refinery operations at Fort McMurray, other locations in northeastern Alberta to decentralize economic activity, or Edmonton and determine alternative locations to develop the entire Alberta economy.

2.2.2.11 Undertake an industrial development analysis of the various classes and sizes of secondary industries which operations would stem from or be induced by the tar sands developments in order that industrial prospecting

for Alberta development could take place.

2.2.2.12 Investigate the feasibility of economic incentives or taxes which would encourage Canadian content and location of the entire production cycle to the finished product.

2.2.2.13 Investigate the feasibility of implementing a tax for not undertaking a prescribed exploration and development coring program and rebating it where satisfactory exploration is carried out on the lease.

2.2.2.14 Implement a lease assignment fee by which not less than half of the assigned lease value less the cost and rental of the lease is paid to the government to be used for lease exploration purposes.

2.2.3 Environmental Objectives and Strategies

The objective with respect to the natural environment should be to enhance and improve it for subsequent land use after the extraction has been comp eted. Water effluents or atmospheric emissions should be controlled to the limits of technology in order that environmental degradation would be prevented. Although land surface disturbances of in situ processing areas will be extensive, the objective should be to minimize the irreparable damage and maintain the integrity of the watershed. On mineable areas the entire surface will be disturbed resulting in extensive surface topographical alterations with drastic changes to the surface and subsurface hydrology. The objective on these areas should be to reclaim them to a subsequent land use more beneficial to society than at present. Equivalent safeguards should apply to ancillary municipal and corporate developments.

Some of the work activities necessary to develop environmental strategies are already underway. The INTEG study, being commissioned by

the Department of the Environment, is studying the effects of eventual multi-plant operation over the extent of the Athabasca tar sands. The interim report is currently being reviewed by the Conservation and Utilization Committee. This study will be an important aspect in the final strategy.

Another major activity is the Fort McMurray townsite planning recently completed by the Provincial Planning Office. Although it is currently projecting only to the development of the Syncrude plant and the population increase caused by it, it is sufficiently open ended that as government objectives and policy take shape, the necessary expansions can be projected. In addition, the Planning Office is also proceeding with the Fort McMurray Regional Plan which will incorporate the numerous ramifications arising from the government's strategy.

A third environmental activity currently underway is an ecological baseline study funded by the Department of the Environment and being carried out by the Alberta Forest Service, the Fish and Wildlife Division, the Parks Division and the Canadian Wildlife Service. This study will provide detailed forest inventory and vegetation information on 3,096 square miles of land of which approximately 430,000 acres could be mined and ungulate, waterfowl, sport fish as well as outdoor recreation capability on 11,340 square miles and on the proposed Fort McMurray pipeline and highway corridor.

In addition, other suggested activities are listed.

2.2.3.1 The development of a satisfactory tar sand exploration and development coring program applicable to those leases subject to overburden less than or equal to 120 feet in depth which information would be pooled with other surface resource information in order to develop a regional mining plan.

2.2.3.2 Discussions and negotiations among the leaseholders to rationalize and redistribute leases on the basis of ore deposits, location to water bodies, surface resources, etc., in keeping with a regional mining plan.

2.2.3.3 The filing of detailed development and reclamation plans as provided by the proposed Land Surface Conservation Act and the regulations in order that the reclamation activity is in full sequence with the mining activity and that the subsequent reclamation be ensured by a security deposit based on the cost of reclamation. This plan contemplates the pre-mining clearing practises, environmental factors during mining, as well as subsequent reclamation and revegetation and includes: the salvage of commercial timber prior to land clearing; the saving and storage of sufficient surface organic and mineral soil for subsequent reclamation; the disposal of tailing according to a predetermined plan showing topography, location, etc.; the reclamation of tailings according to a predetermined plan of vegetation within 3-5 years after mining; and the maintenance of the vegetation for 2 years after planting.

2.2.3.4 Development of an orderly sequence of mining commencing with one drainage basin to fully determine the consequences of the mining and reclamation before other drainage basins are mined.

2.2.3.5 Development of subsequent land use plans based on research which would incorporate reforestation, forage production, wildlife habitat, limited arable agricultural and horticultural production, outdoor recreation developments for casual and commercial purposes.

2.2.3.6 Development and implementation of special air quality control technology designed to take into consideration the micro climatic conditions along the Athabasca River, the density of projected plants, the northern climate and the exposure to a large concentration of people.

2.2.3.7 The zoning and prohibition of mining and tailing sands disposals along the Athabasca River and other designated watercourses required to be maintained to ensure the integrity of the watershed.

2.2.3.8 Waste products from Fort McMurray should be incorporated in the reclamation plans of adjacent mining operations.

2.2.3.9 Pipeline corridors should be developed in order to minimize the amount of land required and also to ensure easier monitoring against spills.

2.2.3.10 The long term use of the mined and reclaimed land could be to support a timber or pulp and paper industry.

2.2.3.11 Undertake a research program to determine the appropriate surface water and groundwater characteristics and sedimentation studies within the Athabasca River and other streams draining mined areas.

2.2.4 Technical Objectives and Strategies

The overriding objective should be to develop and expand the tar sand exploration, extraction, upgrading, processing and reclamation technology in such a direction which would complement the social, economic and environmental objectives. Axiomatic to this objective is the desire that the evolvement of this "tar sand technology" should be led by Canadian technologists; that is, developed, shaped and influenced by Canadians for the benefit of Canadians.

A listing of some of the strategies which would complement the overall technical objective is given:

2.2.4.1 The commitment to undertake an aggressive research and investigation program on all aspects of development of the Athabasca tar sands will benefit Albertans for generations to come. The provincial government should strongly encourage participation in designing construction of plants by Albertan and Canadian engineers, scientists, and technologists,

Becktel contract plus problems of Canadian firms

especially those in the private sector. The providing of such opportunities to Albertans should be an important consideration in any strategy for the further development of the tar sands. The extraction and recovery of the petroleum products from the vast tar sands reserves will provide a real opportunity for Albertans and Canadians to become world leaders in the design of this type of mining and petroleum processing equipment. The achievement of this goal may depend upon gaining significant local equity participation in the further development. Benefits which could be expected to multiply from such a circumstance would be diversification of industry centered on the Athabasca tar sands, and flowing out to other centers in Alberta.

The tar sands offers a unique opportunity to change the historical trend of ever increasing foreign control of non-renewable resource development in Canada. Here is a reserve of the greatest magnitude which does not require highly speculative investment to find and prove. The world wide demand for petroleum will be so compelling within the near future that it should be Alberta's objective to increase Canadian equity participation in the resource developments. Huge amounts of capital will be required for further development of technology and the purchase of plants and equipment. However, to the maximum extent equity capital should be raised in Alberta and Canada recognizing that the usual past constraints of unproven reserves and uncertain markets does not apply in the case of the tar sands.

2.2.4.2 The Alberta Research Council should be developed into the primary research agency to undertake or co-ordinate all fundamental physical research in the extraction, processing, tailings disposal, reclamation and revegetation techniques. In addition, product development technology should be accelerated, especially of those minerals which now go through

Over

the process but are wasted in the tailings sands.

2.2.4.3 Plan and construct an Alberta Research Council field facility at or near Fort McMurray in order that work could be done on site.

2.2.4.4 Obligate the industry to file their research information in order that it could be used to further the knowledge on all aspects of environmental protection.

2.2.4.5 For the purpose of raising research funds to impose a specified levy of not less than 10¢ per acre per year on each leaseholder yielding at least $270,000.00 per year (2,695,049.84 acres leased).

2.2.5 Administrative Objectives and Strategies

The basic administrative or political component objective should be the development of a mechanism by which the Athabasca-Fort McMurray Tar Sands Region would be managed at the regional level in order that there would be effective involvement and participation from the community, the basic industry and the government to undertake the operational planning and implementation of government policies and programs at the regional level consistent with the proposed objectives and strategies.

The following strategies are suggested:

2.2.5.1 Regional development of the Athabasca tar sands has all the elements of normal government administration in any part of the province with the following exceptions: First, it is approaching a period of intensive development and population growth which will probably outstrip the local administrative coping capacity. Second, this development consists of two basic types arising from the Tar Sands development: (a) regional resource development stemming from mineral extraction and processing, environmental protection and reclamation, and subsequent land use and resource management, and (b) urban growth and all its social and physical requirements.

The relative weakness in the local communities ability to cope with strains associated with intensive socio-economic development and the significant inputs that will be required from the provincial government with respect to the resource development and associated urban growth both suggest that it is probably better to maintain the Fort McMurray-Athabasca region development within the provincial context but strengthen those three basic elements which make it exceptional from the balance of the province: (a) local administration, (b) regional resource development and management, (c) urban development.

Strengthening could take various alternative forms ranging from high to low concentration of authority. For instance, it would be possible to establish a single Athabasca Tar Sands Development Commissioner responsible for all government administration within the bituminous sands region and reporting to a single Cabinet Minister. However, a concept of administration embodying the concepts of dispersion of authority and the reliance on concensus appears to be more acceptable. This would mean adopting the structure similar to current structure found within government.

It is suggested that existing structures be strengthened at three levels: at the level of the Executive Council; at the level of senior provincial administrators; and at the regional administrative level.

Executive Council could be strengthened by expanding the Cabinet Committee on Natural Resources and Environment to include the Ministers responsible for Northern Development and Municipal Affairs on matters pertaining to the Athabasca Tar Sands. Thus, an Athabasca Tar Sands Development Cabinet Committee could consist of:

(1) The Minister of Federal and Intergovernment Affairs (Chairman)

(2) The Minister responsible for Northern Development

(3) The Minister of Municipal Affairs

(4) The Minister of Environment

(5) The Minister of Lands and Forests

(6) The Minister of Industry and Commerce

(7) The Minister of Mines and Minerals.

At the senior administrative level the Natural Resources Co-ordinating Council, the Provincial Planning Board and the Conservation and Utilization Committee are the main operational interdepartmental committees. It is suggested that either could be used as a base for establishing a Policy and Planning Group on Athabasca Tar Sands development. This group would be responsible to the Cabinet Committee and its functions would include information exchange, co-ordination and policy planning requirements at the administrative level. Its membership should include representation from at least:

(1) Department of Municipal Affairs

(2) Department of the Environment

(3) Treasury Department

(4) Federal and Intergovernmental Affairs

(5) Department of Lands and Forests

(6) Department of Mines and Minerals

(7) Department of Industry and Commerce

(8) Industry

Initially this group should have a full time planning group seconded to it from the various planning divisions. It would be responsible for the preparation of the operational regional plan arising from the overall development strategy of government. Representation from industry on the policy and planning group on the Athabasca Tar

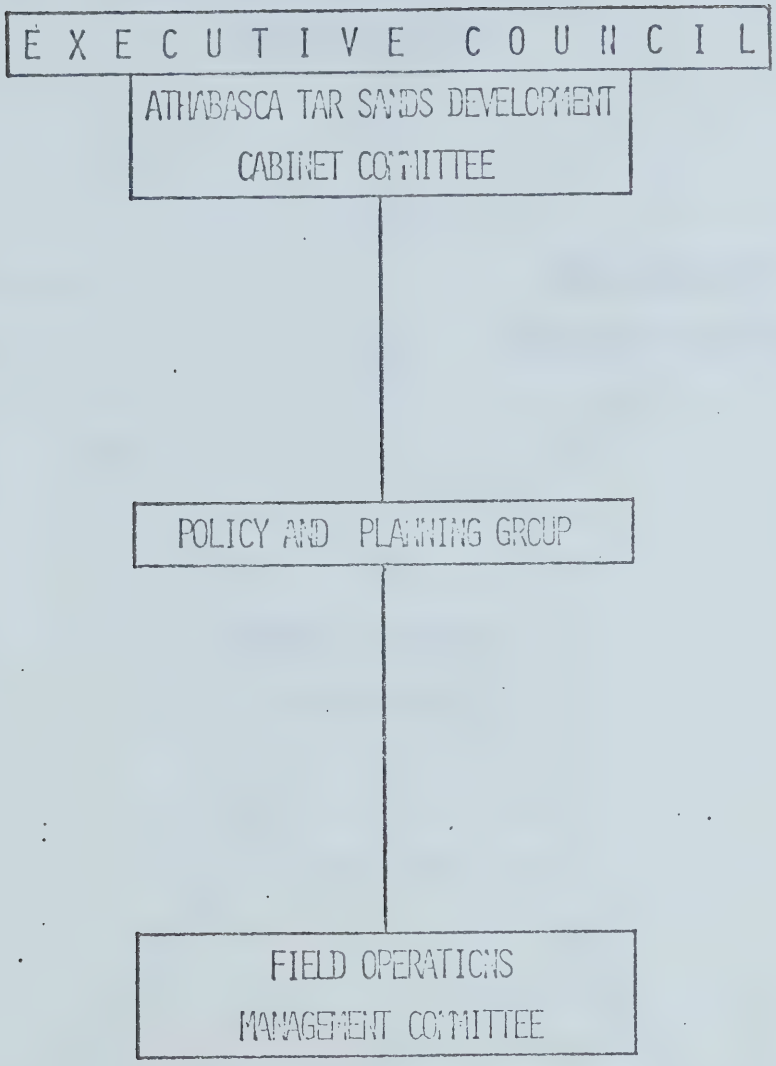
Sands development should be considered.

The regional field staff level requires considerable strengthening, both in manpower and co-ordination. A first step would be to ensure that each appropriate department had a senior field staff position designated for the Athabasca tar sands region. The second step would be the establishment of Field Operations Management Committee comprising of all the departmental field representatives. Their function would be to co-ordinate and integrate their activities with one another in order to provide a unified government service to the public.

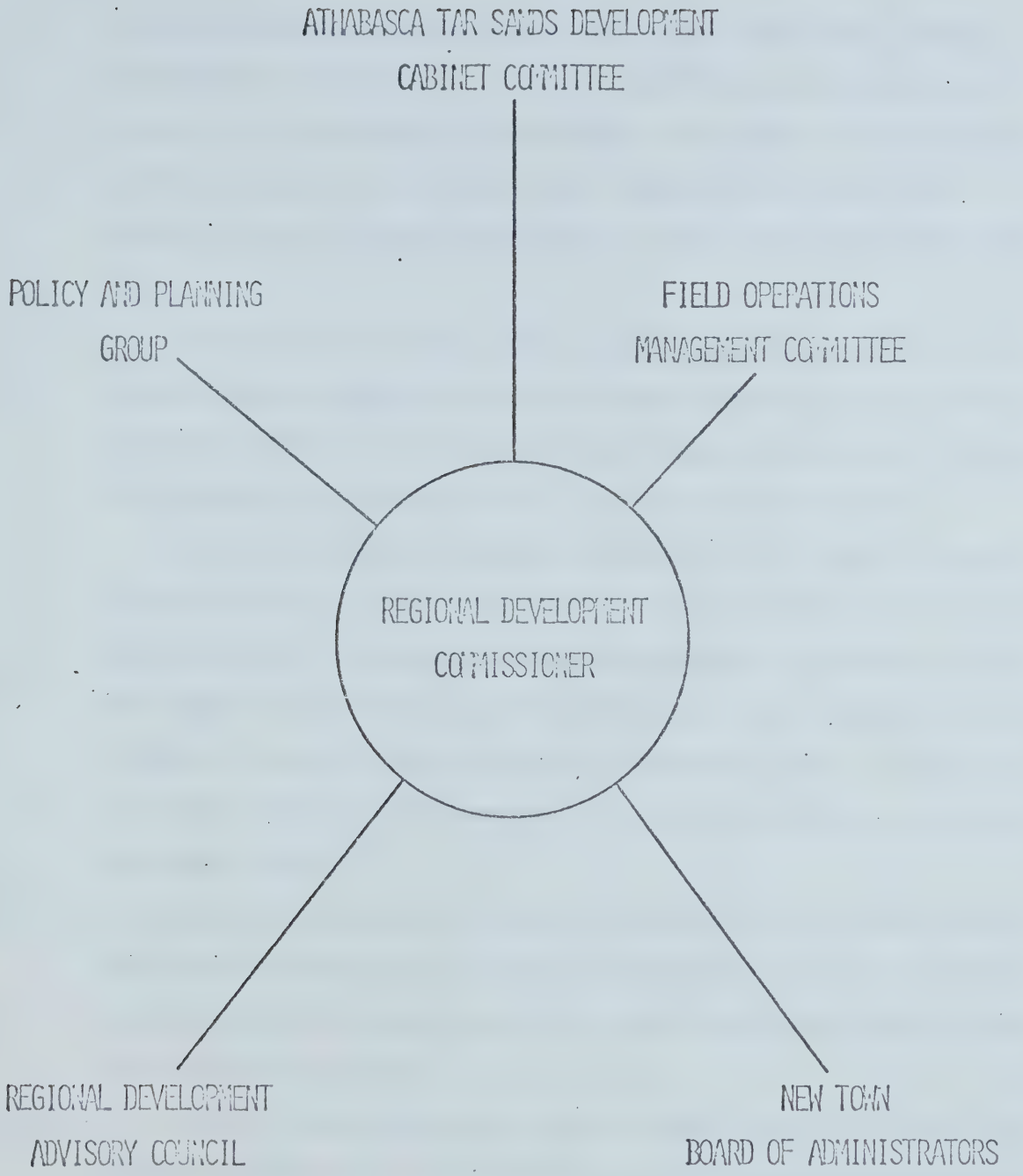
The integration of these three levels; the political, the provincial administrative and the regional administrative with the regional social and business community and the Fort McMurray town administration is probably the most critical but least developed element.

In order to provide the necessary integration at a regional level the establishment of a Regional Development Commissioner's office should be considered. The Regional Development Commissioner and two special assistants would be responsible to determine what action was required to maintain policy implementation and promote its implementation through the responsible regional field staff. In this respect he would be guided by the directions he received from his political superior, the Fort McMurray Regional Advisory Committee, the Fort McMurray Board of Administrators, and the appropriate provincial level administrators and their regional staff. In the case of conflict his power would be in his direct contact with his political superior for a government decision and directive.

This would not be an administrative function, but it would be one of monitoring, evaluating, co-ordinating, integrating and expediting decision making for reference to the government. Its purpose would be



INTERDEPARTMENTAL COORDINATING STRUCTURE



SPHERES OF INFLUENCE

to ensure program consistency with the overall objectives, strategy and policies and to bring anomalies or exceptions to the government's attention for correction or redirection. The purpose of the two special assistants would be to provide special expertise and assistance in the areas of urban development and regional resource development and management.

The proposed structure is not a super department imposed on other departments but rather a regional systems integrator providing lateral integration within a specified geographic region resulting in a bridging of functions and administrations into a comprehensive matrix.

Much of the current uncertainty at provincial or regional administrative levels rest not in the question of how will we do it but on what should be done. Consequently when Executive Council chooses a strategy and formulates their policies the administration will be able to address itself to the operational details of implementing them. In other words, much administrative indecision has arisen from inadequately articulated government policy.

2.2.5.2 Acceptance of the suggestion should be predicated on the premise that the "commissioner" concept, although being dominant initially, should phase out over time, especially in the urban development areas as local and regional administrative capacity grows.

2.2.5.3 The funding of urban municipal works may require special attention over and above The New Towns Act by consolidating the regional local property tax structure with Fort McMurray's to provide the necessary capital funds.

3.0 SUGGESTED DIMENSIONS OF DEVELOPMENT MODEL

Based on our primary and economic objective, the actual rate would depend on Alberta's and Canada's capability to generate sufficient investment capital as well as our requirements for socio-economic development. The projection is based on approximately 1,000,000 barrels capacity per day by the year 2000 which is equivalent to 1 Syncrude sized plant coming on stream every 4 years from now. It anticipates that in situ operations could commence by 1980 and that refinery capacity and a petro-chemical operations could commence during the period 1985-90.

This could require an initial plant construction labour force of 5,000 annually accelerating to approximately 7,500 during the mid to late 1980's. The plant operational labour force would accelerate in 3-4 year lumps at an average rate of 300 per year initially and increasing to approximately 400 per year as refineries and petro-chemical operations commenced.

The secondary services required would approximately double these estimates. The population servicing the developments could be in the order of 85 to 100,000 by the year 2000. Transportation and commuting policies and decentralization of facilities would all have a bearing on these estimates.

It is anticipated that the near future developments (15-20 years) would be limited to within 40 to 50 miles of Fort McMurray in order that additional townsites would not be required till after the mid 1990's. This however will depend on subsequent in situ technology.

It is also anticipated that future mining applications will be

restricted to the west side of the Athabasca River until tailings disposal and reclamation technology has advanced beyond the present state. The projected 1980 or 1984 plant going on stream would in all likelihood be an in situ development.

This suggested scenerio for development could be extended, however it would become more speculative pending Executive Council's response to the basic premise, objectives and suggested strategies. Upon interim response to the suggestions a more detailed projection could be presented.

4.0 SUGGESTED MANAGEMENT OF DEVELOPMENT MODEL

Section 2.2.5.1 describes in some detail the general scope, direction and description of the developmental model. The concept of a "development commissioner" can be modified in degrees from more advisory to more administrative. The individual is probably the key element to its success.

Again, Executive Council's interim response is required to present more detail and recommendation.

5.0 CONCLUSION

As was mentioned in the preface, the objective of this study has been to initiate the process required to establish and implement a comprehensive development strategy for the bituminous tar sands of Alberta. In initiating this process the basic question "What should be done" has been examined by focusing on primary and secondary objectives in order to illustrate the direction of choice. The primary objective which has been suggested is that Alberta should regulate, guide and control the development of the Athabasca tar sands to meet the growing socio-economic needs of Albertans and Canadians. This objective is suggested while simultaneously and fully recognizing that a balance must be struck between controlled development and maintaining investor confidence. Secondary social, economic, environmental, technical and administrative objectives supportive of this primary objective have also been suggested. Further elaboration on these suggestions is found in the appendix to this report.

The essential characteristic of the suggestions is their pro-Canadian and pro-Albertan flavour. The basic premise that the demand for synthetic crude oil is from markets external to Canada, combined with the assumption that substantial net benefits will be derived only if the development is firmly controlled in a manner which complements and supplements the development requirements of Alberta and Canada, leads to the adoption of a pro-Canadian and pro-Albertan policy position. This policy position is viewed as appropriate for a government committed to assuming a role which is supportive of its citizens in their development.

APPENDICES

6.0 APPENDICES

6.1 Methodology

6.1.1 Strategic Planning

This assignment was the highest order of strategic planning which the Executive Council has referred to the Committee. In this context, "strategic planning" is defined as the process of evaluating the external situation in relation to defined, desired objectives and developing a direction for action by which the objectives can be achieved.

Many of the objectives and strategies lie outside the strict interpretation of the legislative purview of the Committee as defined in The Department of the Environment Act. However, because of its broad membership across eleven government departments and agencies responsible for natural resource development and administration, environmental conservation as well as interdepartmental co-ordination, this vehicle was chosen.

The following procedures were used to accomplish the assignment:

(a) discussions among the Conservation and Utilization Committee including several meetings with Intercontinental Engineering of Alberta Ltd. and the use of their progress report on the Athabasca Tar Sands,

(b) requesting written views and opinions from approximately 100 civil servants,

(c) approximately 50 hours of inter-active discussions among five task forces comprising 30-40 civil servants within the appropriate government departments and agencies exploring various concepts,

(d) compilation and review of relevant written material throughout government,

(e) on site inspections and discussions with Great Canadian Oil Sands and Syncrude personnel as well as Fort McMurray residents, and

(f) discussions among task force chairmen.

6.1.2 Development Strategy Components

In order that a more meaningful understanding of the comprehensiveness of the development could take place, a systematic approach was adopted. Five basic subsystems or components were identified for detailed discussion and analysis preparatory to strategy suggestions. They consisted of the following:

(a) social component which included those factors relative to health, education, work, recreation and cultural activities and the objectives and strategies leading to a satisfactory quality of life;

(b) economic component which included the distribution of benefits and costs, maintenance of stability in the distribution of goods and services, diversification of development and the focus of economic activity beneficial to Alberta;

(c) environmental component which included the physical and ecological ramifications of the development on the natural and human environment, and objectives and strategies which could be developed to ameliorate or obviate their impact or alternatively shape the impact to future advantage;

(d) technical component which included the review of existing technology but emphasized the secondary and tertiary technologies for further industrialization and the impact of these technologies on the other components and those objectives and strategies required to complement other objectives;

(e) administrative component which included the regional administrative, co-ordinative and political factors and the appropriate objectives and strategies required to implement the overall strategy.

Each task force included 4 members representing the study component plus one representative from each of the other 4 study components in order that there was a bias in favour of the study component while maintaining a balance and communication with other components.

Considerable duplication of discussion from alternative viewpoints took place. This resulted in an educative process which improved all participants' knowledge of the entire subject area.

6.1.3 Evaluation of the Methodology

The ultimate evaluation of the methodology is Executive Council's assessment of the suggested objectives and strategies, the subsequent policies arising therefrom, and their implementation. One important exception to this statement is that the political acceptability; whether at the international, national, provincial, regional, corporate or individual level, has not received expert consideration or been tested in any manner. This is the proper prerogative of Executive Council. Consequently the objectives and strategies could be rejected, not on the basis of content, but as a result of political unacceptability.

Within the government structure there are several strengths which the "task force" or "project orientation" approach used in this study inherently incorporate:

(a) it permits and encourages the active participation and involvement of numerous civil servants who can make a contribution, regardless of their position in the vertical hierarchical structure, and this enables contributions to be assimilated into the total strategy on

the value of their content rather than on the basis of the contibutors authority or position;

(b) it enables lateral communication across government departments and agencies on an objective basis resulting in improved inter-departmental co-ordination, improved morale and sense of purpose among the specialist and technical staff as well as strengthening working relationships within the administration;

(c) it encourages the formation of temporary problem-oriented groupings to allow objective discussion and the subsequent dissolution of the groups upon completion of the task without requiring permanent restructuring and the inherent bureaucratic dissipation of energies accompanying such moves;

(d) it develops a better informed core of civil servants having a more comprehensive knowledge of government activities and a greater appreciation of the ramifications of their individuals actions as they relate to the whole government structure, resulting in more effective service to the public.

All of these factors were evident in the preparation of this strategy. This methodology is a continuation of the "task force" approach used by the Conservation and Utilization Committee since early 1967. This methodology is bridging the gap during the transition from a rigidly structured vertical bureaucracy to a more functional, laterally communicating, problem resolving oriented system of management.

Three basic weaknesses were encountered. The first two are general in nature whereas the third was more specific to this assignment:

(a) the differentiation between "conceptual or strategic planning" as opposed to "functional or operational planning" was not readily understood. Most civil servants view their planning activities

in the context of "functional or operational planning" i.e., given objectives and policy parameters they plan their organizational implementation tactics. Very few civil servants appreciate the input required at the "conceptual or strategic planning" level in order that Executive Council can assess the suggestions and alternatives to choose the government's objectives and formulate policy parameters required for the next stage of planning preparatory for implementation. Unfortunately the primary and difficult question of "What should be done" becomes confused with the secondary and less demanding question of "How will we do it". Considerable discussion was required to reach a sense of priority between these two basic tasks,

(b) the problems associated with institutional lag within a vertical hierarchical bureaucracy were evident and prevailed to various degrees. Firstly was the question of the degree of priority which this assignment held relative to other organizational priorities. Considerable time was required by the Committee to effectively address itself to the assignment. Secondly, further time was required to make available staff assigned to other tasks who could participate in the discussions and subsequent events prior to the submission of this report.

Within the civil service these are real problems: there are project priorities, program priorities, division priorities, department priorities, government priorities, etc. Which priorities take precedence? The reward system for civil servants is organized in such a manner that assignments and priorities within the vertical hierarchical system are given precedence. To anticipate the civil service to alter its organizational behavior without

restructuring the organizational system and its reward system can and does create tension and stress within the system. Consequently, interdepartmental or governmental activities often are given lower priorities because their attention may conflict with intra-departmental activities. This particular study is a good case in point, where some of the agencies that should be co-operating actively with the natural resources development agencies in order to determine the long range ramifications preferred to be passive participants dealing directly with Syncrude or with their own interests of the immediate development rather than engaging in a more comprehensive and long term outlook.

(c) during the past five years good working relationships have developed among the members of the Conservation and Utilization Committee and among many of their staff. However, since the Committee has in the past limited its activities to problems relating to the natural resources and the environment, the current extension into social and economic related problem areas raised the spectre of vested interests and the concern that the Committee was over extending itself. In relationship to this particular assignment several government departments co-operated reluctantly because of this reason.

In summary, however, it is our opinion that the positive features of the methodology outweigh the negative features and that further experiences will support this opinion. This method should be continued, although questions of priorities and consequences arising from additional assignments require resolution.

6.2 Social Analysis

6.2.1 Social Objectives

The objective with respect to the social or human component should be to encourage the opportunity for the development of individuals within their urban or industry oriented service center in such a manner that they may freely identify, participate and assimilate with their social and cultural environment in order that they may attain a satisfactory quality of life. This objective anticipates man's realization for the fullness of his human potential with respect to work and leisure and assumes societal structures are responsive to or congruent with changing needs and socio-economic condtions. It will require special emphasis on program activities relative to health, education, work, recreation and cultural activities to overcome initial responses to geographical isolation, single industry domination, climatic limitations etc.

6.2.2 External Factors

Of the 84 bituminous tar sand leases issued, 34 lie within that geographic area considered to be surface mineable and 50 lie within that geographic area considered to be extractable by in-situ processes. Seventeen potentially surface mineable leases and 20 potentially in-situ process leases are located within a 40 mile radius of Fort McMurray. Within a 50 mile radius these figures increase to 28 potentially surface mineable leases and 32 potentially in-situ leases.

It has been estimated by Syncrude that for each plant of its projected capacity (125,000 bbls/day) a total population increase of 10,000 residents (1,100 - 1,250 Syncrude employees) will take place at its service center of Fort McMurray. It has also been estimated by Diversified Transporation of Fort McMurray that plant employees will commute 1 hour each way (40 - 50 miles) by bus. Considering the trend towards a longer working day and a shorter working week this is probably a reasonable estimate.

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The implication is not that 60 plants resulting in a projected population increase of 600,000 for Fort McMurray is anticipated. It is suggested however that Fort McMurray should remain in the forseeable future the primary service center for the tar sands development. Given the achievement of the other objectives cited earlier it may be reasonable, for example, to estimate one Syncrude sized plant going on stream every 4 years resulting in 8 plants by 2000 having a capacity of 1,000,000 bbl/day and equivalent refining capacity or other tertiary industry resulting in a total population in Fort McMurray of 100,000. This could be Albertas third largest city. However, it should be recognized that "frontier towns" often cannot attract sufficient manpower.

Given these conservative assumptions it may be further assumed that two basic responsibilities which the multi-national corporations will be involved in relative to our social objectives are the training of approximately 1,000 workers annually and transporting up to 10,000 workers daily. The corporations' attitude, based on Syncrude's proposal for joint cost shared training facilities and GCOS current policy of subsidizing approximately 90% of the transporation costs for most of their employees will probably be positive, depending on the distance factor. Shell Oil however, whose lease lies within the 40 mile radius but on the east side of the Athabasca River has already made informal enquiries regarding the location of its service center. The point is that conflict will arise where the principles of government and the individual corporation do not coincide. There should not be any serious technological or economic limitations in respect to these factors. Transportation could consist of road, rail, or other services.

The balance of the private sector would support these activities as it will provide additional investment opportunities to them in the areas of servicing, housing, transporation etc..

The federal governments response to the objective generally should be favourable. It could however, place a heavy demand on Albertas share of CMHC funds as 500 to 750 permanent residences might be required annually. In addition, the federal government would be required to make substantial investments in upgrading and training programs. This would apply especially to potential employees of native origin. Specially designed and managed programs based on previous experiences would be required.

The greatest burden would fall on municipal shoulders to cope with an extremly rapidly increasing population of a cosmopolitan nature. Very sophisticated program planning, carefully monitored fiscal management, as well as adaptive feedback mechanisms would be required to maintain contact with the growing population.

6.2.3 Government Assessment

The provincial government current policy applicable to the social objective is too vague and fragmented to be even reasonably effective. The various policies which could assist lack co-ordinative cohesion. The total community approach or single service center delivery concept, although often discussed, is not yet a reality. Although the Human Resources Development Authority attempted to co-ordinate these types of activities, it was noticeable for its failure at the provincial level, however some degree of success was achieved at Grande Cache.

There is probably adequate legislation to support the required program activities in health, education, training, recreation, cultural development etc.; the biggest single weakness is its unco-ordinated and unilateral implementation. In many instances the social planning appears to have little relevance or relationship to the natural resource and industrial developments taking place. Little research or innovative action has been taken in the past to design a more liveable community setting such as Fort McMurray. In this respect a northern community should be designed for those

people who have to live in it rather than transplanting a southern community to them. The community should blend with the natural environment.

6.2.4 External Constraints

The greatest constraint associated with the multi-national industries will be sequencing their development plans with the government's development plans for the achievement of our social objectives. This constraint will probably be most dominant in the area of transporation and townsite location.

One additional constraint, although not of great physical magnitude but of considerable concern will be providing the opportunity for the assimilation of indigenous native people into the work force and the cultural stream of society. It must also be pointed out that these people come under two government jurisdications: treaty Indians under federal and Metis and others under provincial jurisdications. Care must be taken that equivalent program activities are undertaken in order to prevent conflict among them. The conditioning required to assimilate the native family unit as well as assimilating familes from many parts of Alberta and Canada will require extremely careful attention in a rapidly expanding population. This same difficulty will arise among young adolecents who have been uprooted from their surroundings and friends and relocated in a new community; especially if the socail, cultural and recreational facilities do not keep pace with the growth.

6.2.5 Social Strategies

It is not intended that the following listing is complete or in any order of priority, but primarily a choice of alternative combinations to achieve our social objective.

6.2.5.1 Establishment of Fort McMurray as the primary service center for the tar sands development projects within a 50 mile radius and limiting proposed

development approvals during the next 20 years to this geographic region.

6.2.5.2 Establishment of a Fort McMurray Regional Development Advisory Committee which would be representative of the public, industry and government in order that there would be an interchange of information between the various groups to encourage co-operative involvement and participation during the planning and growth period.

6.2.5.3 Undertake research and planning for nothern community development for Fort McMurray anticipating massive and rapid growth during the next 25 years.

6.2.5.4 Undertake research and planning for the movement system required in the bituminous sands area, incuding all forms of rapid transit.

6.2.5.5 Planning and establishment of manpower upgrading center which could be phased into a combination vocational training school and community college as the population expanded. It could function to train native and other workers as well as provide vocational evening and academic classes.

6.2.5.6 Develop and construct the first phase of a hospital to service Fort McMurray and the surrounding northern region.

6.2.5.7 Plan and develop an integrated provincial government service center which would operate on the basis of providing all government services from one center. This should be phased over a period of years in order to stay abreast of population growth.

6.2.5.8 Develop a multi-purpose public awareness program which would emphasize the prospective developments and condition the local population and place special attention on the native people in order to encourage their assimilation into the work force and overcome alienation. This latter emphasis could be accomplished in part by arranging short term contract work which the native worker could cope with and become accustomed to industry work habits. Another feature of this program would be to inform the Alberta public in

order to obtain a orderly flow of construction and operational workers and condition them to their occupational and geographic changes.

6.2.5.9 Investigate the feasibility of developing regional air commuter service between Fort McMurray and other communities such as St. Paul, Bonneyville, Lac La Biche, Athabasca, Slvae Lake, Wabasca, Peerless Lake, Ft. Chipewyan and others all within the radius of approximately 175 miles in order that construction workers could live at home and commute in for a 3 day-5 day work week. Many of these workers could be underemployed farmers, native people etc. who would not otherwise be available unless they uprooted their entire family.

6.2.5.10 Investigate the feasibility of developing a preventive industrial health service which would be oriented to special health hazards of the bituminous tar sand extraction industries.

6.2.5.11 Develop and implement a recreational and cultural program especially oriented to meet the diverse demands of a growing "one industry" community which would satisfy the needs of the entire family and of the single workers who move in for a time period and are separated from their homes.

6.2.5.12 Complete the upgrading and paving of Highway 63 in order to prepare for the increasing road travel and overcome in part the feeling of isolation.

6.3 Economic Analysis

6.3.1 Economic Objectives

The economic objectives for bituminous tar sands development should be guided by the desire to control development while maintaining investor confidence.

The basic economic objective should require that a favourable balance between economic benefits and costs be maintained from the public viewpoint; that economic diversifcation be associated with the development resulting in a stable and equitably distributed economy; that a balance be struck between the centralization and decentralization of economic activity; that significant participation by Alberta capital, labor and products be realized; that economic stability be maintained in all markets; and that future economic stability be maintained in all markets; and that future economic development alternatives remain available to Albertans.

6.3.2 External Factors

The primary objective of the tar sands development as well as the economic objectives are totally dependent on Canadian economic participation and control of the consequences of the future development. The issues which will be challanged include:

(a) the distribution of benefits and costs arising from resource allocation,

(b) the maintenance of economic stability arising from the developments,

(c) the diversification of the goods and services derived from the development,

(d) the relationship of centralization to decentralization of economic activity,

(e) the maintenance of an equitable balance between economic benefits and costs from the public perspective, and

(f) the continuation of flexibility with respect to future economic development.

The future developments projected by the multi-national corporations propose the development of the leases, which they may now hold or intend to acquire, in order that when the technological constraints and economic investment opportunities, relative to world wide alternatives are potentially suitable, to produce synthetic crude oil to meet the growing world energy demands, They anticipate the capital investment of approximately $750 million per Syncrude sized plant and the subsequent employment of approximately 1,100 to 1,250 men at an annual payroll of approximately $110 million. Often the construction and operating equipment is manufactured outside of Canada. Many of the senior staff positions both in design, construction and operations are filled by non-Canadians. Much of the synthetic crude is planned to be pipelined out of the region or out of Alberta for processing.

At present, the lease potential information, the extraction and processing technology and the capital control is owned by non-Canadians.

The attitude and expectations of the multi-national corporations will be the same in the development of the tar sands as has persisted in the conventional crude oil industry. Their interests lie in the rate of return on their investment within their entire corporate structure spread across many parts of the world. Traditionally their concerns have been to win the resource and transport it to the market in its crude state. Technologically there is no reason why the synthetic crude oil could not be upgraded for various energy forms or used as feedstock in the petro-chemical cycle, although this is not usually done in Alberta. The reason why this has not been done is that it is contrary to the corporate policy which does not consider questions such as Canadian economic sovereignty. At the present time although some reference is made to the hiring of Canadian labour,

permitting Canadian investment capital and having a Canadian on the management board, few quantifiable guidelines have been established which aggressively ensure the achievement of the primary and economic objectives.

The balance of the private sector would probably welcome the objective as it would open many investment opportunities for smaller Canadian businesses. For example, the present practice at Fort McMurray, where GCOS own a housing development for its employees, might best be served if greater Canadian participation existed. Consequently the profits from housing Alberta residents would accure in Alberta or Canada rather than in other countries.

The federal government is currently pursuing a policy of Canadian economic sovereignty as witnessed by the establishment of the Canadian Development Corporation, federal government investment capital in Pan Arctic, prohibiting the proposed Denison Uranium sales to foreign interests, the Grey Report on Foreign Investment Control, etc. In this respect the proposed objectives should be supportive of federal government action, although the action taken by Alberta should be more positive than federal action to date.

Massive capital injections into the Fort McMurray region at the rate of one Syncrude sized plant going on stream each year (this has been estimated as the requirement of the American crude deficiency) commencing with the Syncrude operations would result by 1982 in a total capital industry investment of $5,250 million and an annual operating payroll of approximately $1,000 million. This would require 20,000 construction workers, 10,000 operating workers and an additional 25,000 other employees. This would require a 1982 population of approxmiately 200,000 to 250,000. The dislocation and instability caused to the Canadian and especially Alberta economy and labour force would be directly contradictory to the economic objective.

At the municipal level the economic objective would be beneficial as there simply is no other way that they could cope with the rate and sequencing suggested by the industry. The figures generated above are for discussion purposes but indicate complete chaos if the projections of this nature actually occur.

6.3.3 Government Assessment

Currently there does not appear to be a well articulated statement of Alberta's economic policy, employment policy, foreign ownership policy, domestic investment policy, etc. which can be extapolated and applied to the tar sands development. There does not appear to be any comprehensive economic planning or fiscal planning policy which would indicate Alberta's investment potential or development requirements.

There is, however, recent legislation enabling the lending of funds for industrial opportunities and an evolving strategy of expanding industrialization outside the larger metropolitan areas. Consequently the philosophy projected by the economic objective appears to be contraint with the evolving industrial development strategy.

At the provincial level, very little information appears to be available about the provinces gross product, the input-output relationships of the economic sector, the government costs of servicing specified industry requirements on a specific investment basis, manpower availability statistics, etc. This general lack of research and planning in this area will make it extremely difficult to determine what rate of development would be best for Alberta or what level of domestic capital could be invested or what percentage of Canadian labour could be specified, etc. Consequently, increased research and planning will be required to determine the basic rate of development to meet Alberta's needs.

The necessary organizational capability probably already exists within

the Departments of Industry and Commerce, Treasury, and Manpower and Labour, however, the co-ordination of their activities on a specified program orientation is required to come to some basic conclusions required to achieve the economic objectives.

6.3.4 External Constraints

The multi-national corporations will vigorously oppose the primary and economic objectives because it will diminish their control and consequently minimize their profits. Alberta must stand firm in the conviction that the tar sands make up approximately one third of the known world petroleum reserves. Furthermore, as the demand for energy throughout the world increases the price per barrel of crude will increase, and the higher the price rises the more economical it will be for the industry to extract process, and synthesize secondary and tertiary components in keeping with our stated objectives. Alberta owns the supply (one third of the wor'ds known reserve) and the greatest demand emanates from markets external to Canada. With time Alberta should be able to utilize the tar sands as a lever in the socio-economic development of the province. Nuclear energy, geothermal energy, or the Colorado oil shales as a substitute for petroleum products will not be competitive economically or technologically with the tar sands for some time.

In addition to regulating the timing and sequencing, the development of the tar sands will be constrained by insisting on Canadian investment and participation. This should be very definitively spelled out.

The province recognizes that the development of the tar sands can only serve the interests of Albertans if Albertans are significant participants in the development. It should be the intent of the province to permit the development of the tar sands only where it has been satisfactorily demonstrated that Albertans and Canadians both will have the opportunity to significantly participate in the development.

It should also be the objective of the province to develop Alberta's capacity for participation in the development.

Significant participation includes the following:

(a) Albertans must have the opportunity to participate in the ownership of the companies developing the tar sands,

(b) Albertans must recieve a fair and equitable return of the depletion of the non-renewable resource of bitumen,

(c) Albertans must be employed in the planning, design, construction and operations of the resource development, and

(d) Alberta produced goods must be utilized in the construction, operation and maintenance of the resource development.

It should be the intent of the province to control that rate of the development in a manner which will minimize the need to import foreign capital, labour or products. By staging the development in a manner consistent with the accumulation of excess capacity in Alberta and Canada, the Alberta Government will be able to ensure that the development of the tar sands will complement and supplement the economic development requirements of Canadians and especially Albertans.

Programs will have to be developed to mobilize factors of production in the direction of the tar sands development. Canadian engineering and manufacturing firms should be informed of the opportunity available, training programs for upgrading manpower supplies may be required, and specific institutions may have to be developed to funnel funds into the tar sands development. However, the onus would be on the resource developer to ensure all significant participation criteria are met. It would be up to government to set reasonable participation criteria.

What are the reasons for having Albertans participate in the ownership

of the tar sands development companies? The most direct reason for the Canadian ownership is that the dividends and capital gains associated with the tar sands development will accrue to Canadians. This will tend to increase the availability of capital (i.e. capital formation) for future investments. Without Canadian participation, dividends and capital gains will accrue outside Canada and Canada will continue to be in a position of relying on foreign investment to develop Canadian resources. Foreign investment often makes it difficult to control the resource development in the best interests of Canadians.

The reasons for utilizing Canadian labour and products to go beyond the direct benefits of employment income. If Canadians participate in all phases of the resource development in a significant manner, then the Canadian labour force will be developing its technological and managerial skills through a learning process. It will be gaining an intimate knowledge of the tar sands technology. The development of technological expertise, once started, is seen as a self-fulfilling or self-feeding process. It stimulates new technologies and is seen as the basis upon which the viability and vitality of economy and society depend.

If Canadians are in control of this new technology, then they can utilize this knowledge to further the economic and social development of the country. Industrial and economic development are ultimately dependent upon technological know-how. Canadians and especially Albertans can utilize the development of this unique technology as the lever to further the development of new technologies and ultimately the development of the society.

Thus, the intimate involvement of Albertans and Canadians in the development of the tar sands is seen as a means by which to develop Canadian technology, the Canadian economy and ultimately the Canadian society. It is viewed primarily as a development lever and secondarily as a source of

income. However, the significant participation criteria must be qualified by an economic stability criteria.

It should also be the intent of the province to control the rate of development of the tar sands in a manner which will minimize disruptive effects on the Canadian and Albertan economies. The development should not be allowed to proceed at a rate which will result in serious dislocations in money, labour and product markets. If control is not exercised, prices, wages and interest rates will rise, to the detriment of Canada's international trade position.

Many of the proposals arising out of the primary and economic objectives will impinge directly or indirectly on federal government policy or legislation. Although as indicated earlier the objectives will probably have their support, the implementation of them will have to be closely synchronized in order that we enjoy their full support.

Issues such as limiting foriegn capital, permitting only those foreign technicians to work in Alberta where domestic equivalent labour is not available, specifying component equipment parts to be manufactured in Canada, refusing entry of those components which can be manufactured in Canada, encouraging the purchase of equipment not being manufactured in Canada from countries purchasing Canadian products or encouraging them as a result to purchase surplus Canadian products (agricultural commodities, etc.) would all involve federal authority.

Several areas of constraint with the federal government are relative to the national energy policy or a prospective national resource or continental resource policy. Attempts to regulate and control development at the provincial level could be frustrated by negotiations between Canada and other countries at the federal level. Another feature could be the distribution of markets between the domestic supply and foreign supply which again are constrained by national policy.

6.3.5 Economic Strategies

A listing of some of the activities which would complement the overall economic objective is given:

6.3.5.1 Commission consultants to develop a research study project which would measure the economic activity of the GCOS plant to the Canadian economy, the Alberta economy and determine the various economic parameters contributing to a viable benefit-cost analysis of the entire plant related operation.

6.3.5.2 Undertake the research of 6.3.5.1 in order that a basic understanding could be projected for a Syncrude sized plant with reference to the impact that it would have on the total economy.

6.3.5.3 Inventory the design construction and operation labour requirements, their cost and origin and ancillary services (taking into consideration modified technology) of the GCOS plant and project them for a Syncrude sized plant and determine the Canadian content deficiency for various classes of activity and technology and determine feasibility of overcoming the deficiency.

6.3.5.4 Inventory the materials, parts and equipment requirements, their cost and origin of the GCOS plant and ancillary services and project them (taking into consideration modified technology) for a Syncrude sized plant and determine the Canadian content deficiency for the various types of components and determine whether Canadian alternatives are available at present and at what cost differential, or whether they could be economically manufactured in Canada.

6.3.5.5 Undertake research to determine the availability of investment funds in Alberta or Canada which could be channelled from the private sector into the tar sands development.

6.3.5.6 Undertake research into the concept of utilizing Alberta's public or quasi-public institutional investments to facilitate the financing of tar sands developments. If these funds or a portion thereof could be allocated to

the tar sands development and if the same principle were applied to other similar institutions considerable Alberta development capital could be generated for Alberta capital formation.

6.3.5.7 Investigate the feasibility of employing the Canada Development Corporation with the Treasury Branches to funnel Alberta development capital into the bituminous tar sands development.

6.3.5.8 Investigate the feasibility of employing the Canada Development Corporation as a feasible alternative 6.3.5.7.

6.3.5.9 Explore the ramifications of capital restrictions, labour restrictions, and material and equipment restrictions with the federal government with respect to international trade and commerce agreements, labour and immigration agreements, reciprocal trade and tarriff agreements, etc.

6.3.5.10 Undertake and economic analysis of the petro-chemical processing, transporation and marketing economics with respect to refinery operations at Fort McMurray, other locations in northeastern Alberta to decentralize economic activity, or Edmonton and determine alternative locations to develop the entire Alberta economy.

6.3.5.11 Undertake an industrial development analysis of the various classes and sizes of secondary industries which operations would stem from or be induced by the tar sands developments in order that industrial prospecting or Alberta development could take place.

6.3.5.12 Investigate the feasibility of economic incentives or taxes which would encourage Canadian content and location of the entire production cycle to the finished product.

6.3.5.13 Investigate the feasibility of implementing a tax for not undertaking a prescribed exploration and development coring program and rebating it where satisfactory exploration is carried out on the lease.

6.3.5.14 Implement a lease assignment fee by which not less than half of the assigned lease value less the cost and rental of the lease is paid to the government to be used for lease exploration purposes.

6.4 Environmental Analysis

6.4.1 Environmental Objectives

The objective with respect to the natural environment should be to enhance and improve it for subsequent land use after the extraction has been completed. Water effluents or atmospheric emissions should be controlled to the limits of technology in order that environmental degradation would be prevented. Although land surface distrubances on in situ processing areas will be extensive, the objective should be to minimize the irreparable damage and maintain the integrity of the watershed. On mineable areas the entire surface will be disturbed resulting in extensive surface topographical alterations with drastic changes to the surface and subsurface hydrology. The objective on these areas should be to reclaim them to a subsequent land use more beneficial to society than at present. Equivalent safeguards should apply to ancillary municipal and corporate developments.

6.4.2 External Factors

The projected developments propose the extraction of bituminous tar from the ore body by the use of surface mining or steam injected in situ processes. It is anticipated that variations or modifications to this basic technology will occur over time. The basic impact on the environment will be partial to total denudation of the surface vegetation, partially disrupted to totally obliterated surface hydrology, extensive changes to the groundwater regime caused by increasing injections and recharge capability modified by a vastly increased permeability rate of the bituminous depleted sands, altered topographical landforms caused by the deposition of spent tailings or the subsidence of depleted sands, massive withdrawals of surface water from streams and rivers causing physical changes to their stream flow

characteristics, heated effluent waters resulting in chemical and biological changes to the receiving waters and atmospheric changes such as ice fog during the winter, atmospheric gaseous emissions containing sulphur dioxide and other compounds, all of which will have disruptive effects on the remaining flora and fauna because of the massive ecological changes. In addition, there will be those environmental changes caused by the numerous transportation and communication networks as well as the growth of Fort McMurray and other townsites and the effect of these increasing populations and their accessibility to the surrounding environs.

The attitude and expectations of the multi-national corporations proposing the development is premised on investment opportunities throughout the world, the size of their investment and the ultimate rate of return on that investment. In order that they may maximize their profits they will tend to externalize as many of the costs arising from the projects as can legitimately be done. Since the environmental costs of this development are extremely high and since the current technology and economics of extraction are still in their operational infancy, the tendency will be for the corporate structures to externalize these costs for society to absorb.

Part of this dilemma arises from the fact that it becomes virtually impossible to adequately define and quantify the environmental costs since our operational knowledge of the various ecosystems is also in its infancy. Another part arises from the extrapolation of the philosophy and operational policies of the conventional crude oil industry and extending this to a bituminous tar sands policy. Although the corporate structure may be the same, many of the critical parameters are vastly different. These differences must be recognized and accommodated in any policy formulation.

The conventional crude oil industry undertakes numerous seismic operations and on the basis of geological interpretations drills wells in specified locations which will assure the greatest marketable recovery from the relatively homogeneous pool being developed. Since exploratory seismic operations are undertaken prior to obtaining a mineral lease and drill logs can be extrapolated to adjacent areas, the information gathered in locating the economic payoff is valuable in maintaining a competitive advantage in obtaining or developing a lease. Consequently, a high degree of confidentiality is exercised in maintaining this information. The land surface required to exploit the resource and the manpower required in comparison to the bituminous sands is relatively insignificant. Furthermore, the extraction and processing technology has advanced to a relatively sophisticated level since the early American developments.

The search for bituminous tar sands, however, includes other factors for optimum operational design to achieve our environmental objectives which is more effectively obtained by coring instead of traditional seismic operations. The surface topography and drainage pattern; the organic, mineral and water content and depth of overburden; the relative uniformity of the contact zone between the overburden and the bituminous sands, the bitumen content, and heavy mineral content within the sands and their depths; the sand particle size distribution, the clay types and content; and the uniformity of the bituminous sands contact zones with the limestone substrate are required information to design a systematized surface mining and processing operation. Furthermore, because of the heterogeneity of the ore deposits and the fact that the surface topography and ore deposits have no logical relationship to the size or configuration of

existing leases, the information cannot be regarded as confidential, but requires pooling for better planning of the entire region because of the extensive resultant surface disturbances. In addition, the mining, extraction, tailing disposal and reclamation technologies are relatively new Canadian developments which are currently limiting factors of plant operation as opposed to that of synthetic crude processing.

Similar but less intensive types of information and its subsequent pooling will be required for in situ processing, as well as transportation and communication networks. This high degree of interdependent activity between competing corporate sturctures and government will be necessary to achieve the environmental objective which visualizes the resource extraction as the initial phase of land use. But even if the corporations are prepared to accept their responsibility in reclaiming the lands to a state comparable to its initial state, they certainly will not extend this to an enhancement of the environment.

Other components of the private sector will guide their developments and expectations on the response of the multi-national corporations. Although an element of "frontier attitude" may prevail with respect to the environment, the service and secondary industry developments are usually not as close to the threshold of technology, consequently their economic situation may not be as critical.

The federal government's response to the objective will generally be favorable although their involvement normally would be minimal since the administration of natural resources is the consitutional prerogative of the Province. Their current thrust in the environmental related areas, the fact that the Athabsca River is a major portion of an inter-provincial navigable waterway and is subject to

the Fisheries Act, their increasing involvement in water basin planning, the fact that this is a migratory bird flyway and the huge scale of development of such great economic interest to Canada which in some ways will compete with their Pan Arctic interests, and the need for inter-provincial pipelines will greatly accelerate the federal presence.

The municipal response to this environmental objective will be tempered by their ability to fund the necessary drainage, sewage, transportation, beautification and other projects. Generally their response should be positive since they as citizens will reap the long term benefits of the objective as future land uses anticipate alternate land use and economic stability as the sands become depleted and ensure a multi-dimensional existence for the municipalities.

6.4.3 Government Assessment

The provincial government's existing policy applicable to achieving the environmental objective is poorly defined, inconsistent, and totally lacking in cohesiveness. The assorted applicable policies reflect departmental or program biases from numerous perspectives; subsurface resource extraction, surface resource development, environmental protection, functional planning, etc. This is as confusing to the internal government system as it is to the external private system.

Although there is relatively strong legislation governing air and water pollution control, water diversion, resource management, regional planning and energy resources conservation, the legislation regulating and controlling the largest single factor - surface disturbances - is presently inadequate to achieve the objective. The proposed Land Surface Conservation Act presently being drafted would overcome the existing weakness which would permit more effective planning of these developments and also provide for the subsequent

reclamation to specified standards. It will also enable cost sharing agreements between the developer and government to permit reclamation beyond its initial state.

During the past decade, relatively insignificant funds or program activity have been allocated to the research and development required to prepare operational plans for the development of the tar sands coincidental with the environmental objectives. Consequently, the government is at a decided disadvantage in this respect, partly because although the development was considered axiomatic but not imminent and it was also assumed that the conventional crude oil industry philosophy would continue to apply to the bituminous tar sands development and that industry would set the direction and trend for their activity. In addition, the recent environmental phenomena and societies greater emphasis on quality of life as opposed to a quest for increasing living standards has also resulted in this state of unpreparation. For these reasons, very greatly accelerated fiscal and program requirements are required to adequately meet this challenge.

At the provincial level, the necessary organization and administration is reasonably well developed to undertake the government's role. Interdepartmental and interdisciplinary working relationships which have developed among the Departments of Environment, Lands and Forests, Municipal Affairs, Mines and Minerals, Agriculture and the Energy Resources Conservation Board with the assistance of the Conservation and Utilization Committee, Provincial Planning Board and Natural Resources Co-ordinating Council among others can co-operatively shape the program direction at the provincial level.

This, however, does not apply at the field or regional level. As a result of its isolated location and limited development, regional

co-ordination and administration has been lacking. Increased government services approximating some degree of regional resource management will be required to adequately cope with the situatinn.

6.4.4 External Constraints

The major constraint in relationship to the multi-national corporations is the lack of their willingness to co-operate with the government and their competitors in providing information, technology and capital in order that a comprehensive regional resource development plan encompassing the entire bituminous tar sands area can be developed. Although this will be a substantial constraint, Alberta must recognize that the leverage it has in negotiating with industry, by virtue of the location of the deposits, is even greater. Other parts of the world such as South America or the Middle East have been successful in negotiating to their countries advantage.

Another constraint which will face the industry is undeveloped technology. Consequently, the primary objective of limiting development to coincide with Alberta's needs should overcome the potential of developing in excess of environmental technology resulting in irreparable degradation. At the present time, there are innumerable problems related to the effective disposal of tailings and reclamation of the land surface. Although it is partly a result of insufficient knowledge based on inadequate research results and research funds, it is also probably more as a result of the attitudinal influence of the conventional crude oil industry.

In general, there will be economic constraints applying to the private sector as well as the municipal levels. However, if the premise is accepted that the initiator of a development must pay for the adverse consequences, then it must also be foreseen that the

necessary approvals are not given unless the fiscal ability to pay is evident. In those matters relating to municipal or provincial jurisdiction, the royalty or tax structure must anticipate these costs.

Quite conceivably there will be constraints at the federal level with respect to environmental criteria applying to inter-provincial pipelines, navigable waterways, etc. Their role in Pan Arctic and given the current status of federalism could emphasize constraints in this area.

6.4.5 Environmental Strategies

Some of the work activities necessary to develop environmental strategies are already underway. The INTEG study, commissioned by the Department of the Environment, is studying the effects of eventual multi-plant operation over the extent of the Athabasca tar sands. The interim report is currently being reviewed by the Conservation and Utilization Committee. This study will be an important aspect in the final strategy.

Another major activity is the Fort McMurray townsite planning recently completed by the Provincial Planning Office. Although it is currently projecting only to the development of the Syncrude plant and the population increase caused by it, it is sufficiently open ended that as government objectives and policy take shape, the necessary expansions can be projected. In addition, the Planning Office is also proceeding with the Fort McMurray Regional Plan which will incorporate the numerous ramifications arising from the government's strategy.

A third environmental activity currently underway is an ecological baseline study funded by the Department of the Environment and being carried out by the Alberta Forest Service, the Fish and Wildlife

Division, the Parks Division and the Canadian Wildlife Service. This study will provide detailed forest inventory and vegetation information on 3,096 square miles of land of which approximately 430,000 acres could be mined and ungulate, waterfowl, sport fish as well as outdoor recreation capability on 11,340 square miles and on the proposed Fort McMurray pipeline and highway corridor.

In addition, other suggested activities are listed:

6.4.5.1 The development of a satisfactory tar sand exploration and development coring program applicable to those leases subject to overburden less than or equal to 120 feet in depth. Information would be pooled with other surface resource information in order to develop a regional mining plan.

6.4.5.2 Discussions and negotiations among the leaseholders to rationalize and redistribute leases on the basis of ore deposits, location to water bodies, surface resources, etc., in keeping with a regional mining plan.

6.4.5.3 The filing of detailed development and reclamation plans as provided by the proposed Land Surface Conservation Act and the regulations in order that the reclamation activity is in full sequence with the mining activity and that the subsequent reclamation be ensured by the deposition of a security deposit based on the cost of reclamation. This plan contemplates the pre-mining clearing practises, environmental factors during mining, as well as subsequent reclamation and revegetation and includes: the salvage of commercial timber prior to land clearing; the saving and storage of sufficient surface organic and mineral soil for subsequent reclamation; the disposal of tailings according to a predetermined plan showing topography, location, etc.; the reclamation of tailings according to a predetermined plan of

vegetation within 3-5 years after mining; and the maintenance of the vegetation for 2 years after planting.

6.4.5.4 Development of an orderly sequence of mining commencing with one drainage basin to fully determine the consequences of the mining and reclamation before other drainage basins are mined.

6.4.5.5 Development of subsequent land use plans based on research which would incorporate reforestation, forage production, wildlife habitat, limited arable agricultural and horticultural production, outdoor recreation developments for casual and commercial purposes.

6.4.5.6 Development and implementation of special air quality control technology designed to take into consideration the micro climatic conditions along the Athabasca River, the density of projected plants, the northern climate and the exposure to a large concentration of people.

6.4.5.7 The zoning and prohibition of mining and tailing sands disposals along the Athabasca River and other designated water courses required to be maintained to ensure the integrity of the watershed.

6.4.5.8 Waste products from Fort McMurray should be incorporated in the reclamation plans of adjacent mining operations.

6.4.5.9 Pipeline corridors should be developed in order to minimize the amount of land required and also to ensure easier monitoring against spills.

6.4.5.10 The long term use of the mined and reclaimed land should be to support a timber or pulp and paper industry.

6.4.5.11 Undertake a research program to determine the appropriate surface water and groundwater characteristics and sedimentation studies within the Athabasca River and other streams draining mined areas.

6.5 Technical Analysis

6.5.1 Technical Objectives

The overriding objective should be to develop and expand the tar sand exploration, extraction, upgrading, processing and reclamation technology in such a direction which would complement the social, economic and environmental objectives. Axiomatic to this objective is the desire that the evolvement of this "tar sand technology" should be lead by Canadian technologists, that is, developed, shaped and influenced by Canadians for the benefit of Canadians.

6.5.2 External Factors

Initially, the provincial government funded the research on which much of the tar sand extraction technology is currently based. More recently, however, research has increasingly been carried out by individual multi-national corporations although the Alberta Research Council is still active in this area.

Unfortunately, however, most of the tar sands research appears to have been directed toward bituminum extraction processes, mining methods, or in situ experiments. We are not aware of any research with respect to tailings disposal, reclamation or revegetation. This apparent emphasis on winning the resource is again an indication of the heavy influence of the conventional crude oil industry.

The information gathered and research undertaken by industry is classified or privileged information and consequently it is difficult to determine what has been done. In the area of tailings disposal, reclamation and vegetation, it is assumed that very little has been done as evidenced by their serious problems and lack of progress in coping with these problems.

The waste from the hot water process is composed of sand, water, suspended fine clays and minerals, bitumen, sulphur compounds, plus caustic and other chemicals used in the process. The volume of this waste is incredible, and finding suitable disposal sites will continue to be a major problem during the early stages of operation as it comes on stream. Under the Syncrude application tailings will be disposed of in the mined out area, but only after excavation has continued for 3 or 4 years. Syncrude has already applied to divert Beaver Creek and to create a disposal pond by dyking 9.3 square miles of the natural basin surrounding Mildred Lake. GCOS has recently applied to dispose of waste in Ruth Lake, owing to difficulties with their process in being unable to contain the wastes in the 2 square mile settling basin on the edge of the Athabasca River.

Assuming a production rate of 1 million barrels daily (8 Syncrude type plants) and that half of the water used can be recycled, the waste would amount to approximately 2 million cubic yards per day. This volume is approximately equal to 17 times greater than the Legislative Building! Apparently GCOS has found fine clay particals do not settle in the ponds as quickly as have been hoped. This delays recycling of the water back through the process. If this problem persists, or for other reasons such as chemical changes brought about by the sulphides, caustic additives, clay types and chemicals, all of the waste water may be unsuitable for recycling and the disposal problem will become critical.

The downstream environmental effects on the Athabasca and McKenzie River systems of the accidental release of enormous volumes of these wastes can only be considered with alarm.

Other consequences of the tailing ponds are:

(a) During winter, persistant ice fog forms because the waste arrives at the ponds at approximately 130°F. The environmental effects of extremely high humidity through extended cold periods should require immediate investigation. Other problems arising because of the fog are the reduced visibility for auto and aircraft traffic, and the actual operation of the mining equipment. (The drag line operator at Syncrude plant must be able to see clearly 200-300 feet in order to be able to reject noncommercial bitumen deposits.)

(b) The ponds present a hazard to both wildlife and migratory waterfowl owing to the possible toxicity of the liquid and accumulations of bitumen which floats on the surface of the ponds.

(c) The addition of caustic soda during the hot water process has the effect of raising the pH. of the tailings stream which may prevent, or make more difficult, ultimate reclamation because conifers prefer slightly acidic soil.

In addition to these undesirable affects, the tailings ponds will automatically render uneconomic the unmined bitumen lying below when a mined out area is not used for disposal. Continuance of this practice may not appear to have been a responsible method to succeeding generations of Albertans. In summary, it can be said that the hot water process with its concommitant tailings ponds will have a very adverse affect on the environment. It cannot be too strongly emphasized that alternative process methods must be developed, as an urgent priority and responsibility of the government.

Assuming again the production of 1 million barrels per day in the Fort McMurray area, maximum sulphur dioxide emissions from the sulphur recovery plants and from the burning of coke or residual oil for power generation will amount to about 1.6 times the maximum sulphur dioxide emitted by all natural gas plants in Alberta at 1971 levels. Since the Fort McMurray processing plants will be relatively close together, and many of the airborne effluents may combine during adverse meteorological conditions, it is obvious that current technology and recovery efficiencies must change drastically before additional plants should be approved.

The federal government does not appear to have been greatly involved since the closing of their Abasand plant near Fort McMurray during the early thirties.

The present objective for utilization of bituminous sand is the development of a synthetic crude feedstock for refineries primarily located outside of Canada. As an alternative, the location of some refining capacity in the Fort McMurray area to produce upgraded petroleum fractions such as gasoline, kerosene, and jet fuel, etc. would greatly enhance the local and provincial benefits. Such varied products could be shipped in the same pipeline, without mixing, by using existing pipeline technology.

The prospect of having industry agree to locate some refining capacity in the Fort McMurray area are probably good if the apparent trend against granting approval to applicants for new or additional refining capacity in several states of the United States continues. It is estimated that a 100,000 barrel per day modern refinery would have a total operating staff of about 250 employees, including managerial and office personnel.

The economic possibility for further local processing into products is more speculative owing to the competitive disadvantage under which the Canadian chemical industry must operate. However, the problem of serving relatively small markets within Canada that are separated by long distances entailing high transportation costs may be expected to diminish, albeit slowly, as our population grows and the price of petroleum and chemical feedstocks rises. The opportunity ultimately to produce petrochemicals for export may be lost forever if the synthetic crude from Fort McMurray is initially used as feedstock to sustain and expand a processing industry located outside Canada.

The petrochemical industry is primarily based on products derived from cracking processes:

(a) ethylene (e.g., styrene, vinyl chloride, polyethylenes, ethylene oxide, polyethyleneoxides, acetaldehyde, propionaldehyde, ethanol, ethylchloride, etc.)

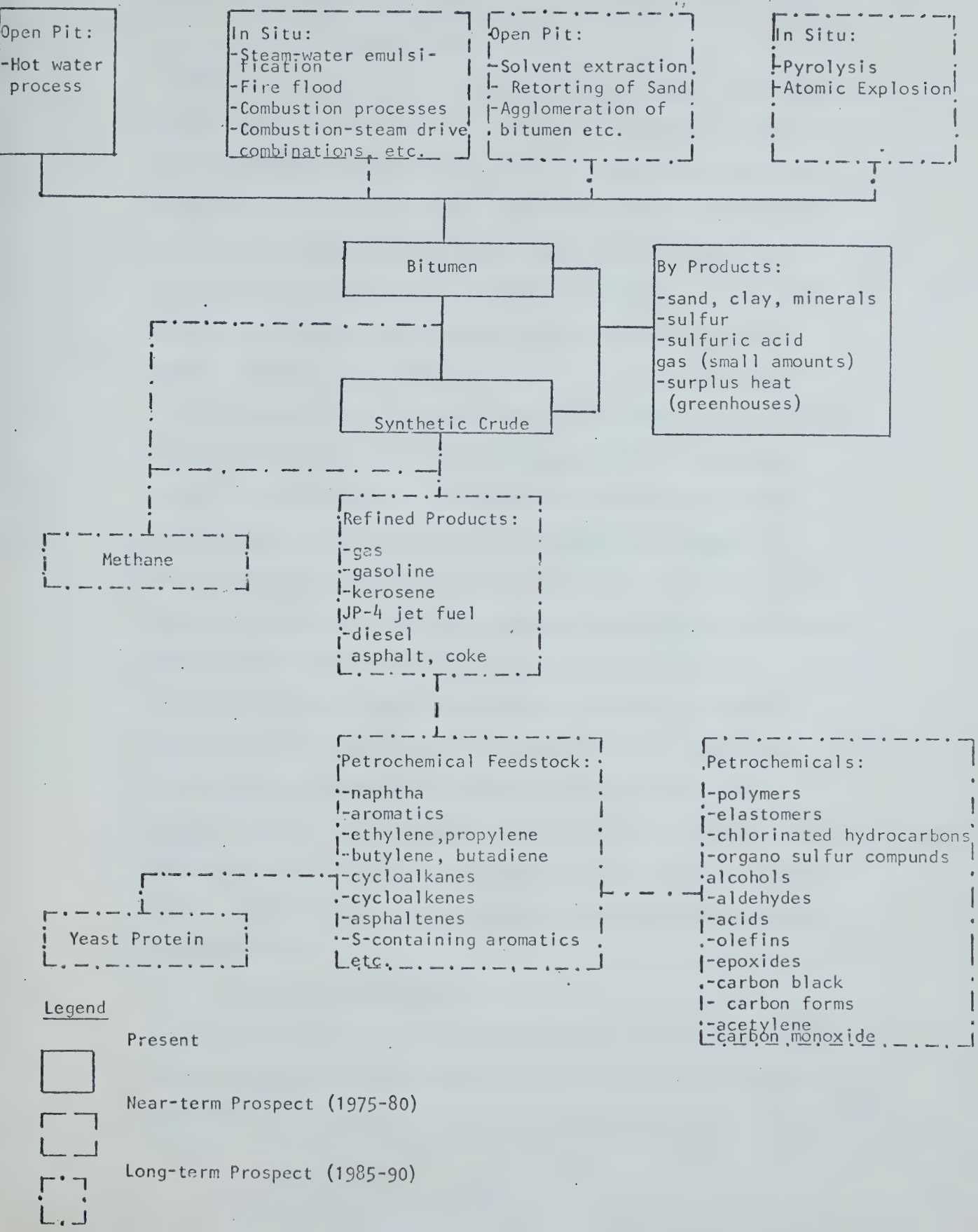
(b) propylene (e.g., acrolein, acrylonitrile, phenol, n-butanol, butyraldehyde, isopropanol, perchloroethylene, propylene oxide, allylchloride, propylene chlorohydrin, polypropylene, etc.)

(c) butene, isobutylene and butadiene (e.g., rubbers, 2-butanol, methyl ethyl ketone, maleic anhydride, chloroprene, t-butylphenols, methacrylates, nylons, phthallic anhydride, etc.)

(d) aromatics (e.g., benzene, toluene, xylenes, ethylbenzene, styrene trimellitic anhydride, phthallic anhydride, teraphthallic and isophthallic acids, phenols, etc.)

(e) carbon monoxides (e.g., alchols, aldehydes, olefins)

Potential Product Development from Bitumen



(f) paraffins (e.g., alcohols, aldehydes, acids, fermentation products, etc.)

Many of these products are the basic chemicals for the synthetic polymer industry producing fibres, plastics, elastomers, or the various additives compounded with these products such as the pasticizers, stablizers, antioxidants, inhibitors, etc. As an extended future step, it might be possible to produce many of these basic petrochemical products in the Fort McMurray area and ship to markets in other areas in Canada, the United States, or for export by a products pipeline to the coast.

Another major area in which considerable research and development is underway at the present time is the manufacture of synthetic methane. In anticipation of the natural gas shortage which will probably occur within 20 years, the conversion of carbonaceous material to methane is actively being tested on a pilot plant scale. Bitumen may also benefit from this research whereby it could be used as a feedstock, like coal, for any gasification process.

A very long-term application could be the use of bitumen as a substrate for the culture of microorganisms such as bacteria and yeasts. Current technology requires that normal paraffins be employed, but there may be strains discovered that can utilize the complex cyclic and aromatic ring systems that are found in Athabasca bitumen. These products could supplement existing plant and animal protein sources.

6.5.3 Government Assessment

It has been the policy of the government for many years to have the Alberta Research Council undertake research projects to develop methods for bitumen extraction, either by mining the sands or using

the in situ process. In this respect the government agency has an enviable record. It has also been co-operating with other agencies in some vegetation research.

In light of the environmental difficulties that will have to be controlled it is evident that for greater research emphasis must be placed on all aspects of tar sands research, including revegetation and reclamation. The Alberta Research Council is the proper government agency either to undertake the work or coordinate the work among other agencies.

6.5.4 External Constraints

The industry should be required to make its research findings to the Alberta Research Council. A special research levy should also be assessed on a per lease acreage basis in order that more funds are available for this purpose. It is assumed industry would be opposed to this requirement.

The federal government, although basically responsible for research would not be opposed to the objective and would in fact do much of the reclamation and revegetation research.

6.5.5 Technical Strategies

6.5.5.1 The commitment to undertake an aggressive research and investigation program on all aspects of development of the Athabasca tar sands will maximize benefits to Albertans for generations to come. The provincial government should strongly encourage participation in designing construction of plants by Albertan and Canadian engineers, scientists, and technologists, especially those in the private sector. The providing of such opportunities to Albertans should be an important consideration in any strategy for the further development of the tar sands. The extraction and recovery of the petroleum products from

the vast tar sand reserves will provide a real opportunity for Albertans and Canadians to become world leaders in the design of this type of mining and petroleum processing equipment. The achievement of this goal may depend upon gaining significant local equity participation in the further development. Benefits which could be expected to multiply from such a circumstance would be diversification of industry centred on the Athabasca tar sands, and flowing out to other centres in Alberta

The tar sands offers a unique opportunity to change the historical trend of ever increasing foreign control of non-renewable resource development in Canada. Here is a reserve of the greatest magnitude which does not require highly speculative investment to find and prove. The world wide demand for petroleum will be so compelling within the near future that it should be Alberta's objective to increase Canadian equity participation in the resource and development. Huge amounts of capital will be required for further development of technology and the purchase of plants and equipment. However, to the maximum extent equity capital should be raised in Alberta and Canada recognizing that the usual past constraints of unproven reserves and uncertain markets does not apply in the case of the tar sands.

6.5.5.2 The Alberta Research Council should be developed into the primary research agency to undertake or coordinate all fundamental physical research in the extraction, (especially in situ processes), processing, tailings disposal, reclamation and revegetation. In addition, product development technology should be accelerated, especially of those minerals which now go through the process but are wasted in the tailings sands.

6.5.5.3 Plan and construct an Alberta Research Council field facility at or near Fort McMurray in order that field work could be done on site.

6.5.5.4 Obligate the industry to file their research information in order that it could be used to further the knowledge on all aspects of environmental protection.

6.5.5.5 For the purpose of raising research funds impose a specified levy of not less than 10¢ per acre per year on each leaseholder yeilding at least $270,000.00 per year (2,695,043.84 acreas have been leased).

6.6 Administrative Analysis

6.6.1 Administrative Objectives

The basic administrative or political component objective should be the development of a mechanism by which the Athabasca-Fort McMurray Tar Sands Region would be managed at the regional level in order that there would be effective involvement and participation from the community, the basic industry and the government to undertake the operational planning and implementation of government policies and programs at the regional level consistent with the proposed objectives and strategies.

6.6.2 External Factors

Fort McMurray and all of the Athabasca tar sands lie in Improvement District #18. The town is administered by a locally elected Board of Administrators under The New Towns Act. The Municipal Field Services Branch of the Department of Municipal Affairs administers the Improvement District.

Several government departments have regional staff located in Fort McMurray, others commute from locations in north eastern Alberta or from Edmonton.

Information gathered from townspeople, local administrators and GCOS and Syncrude staff all indicate that the administrative situation should be improved. Given the vast growth potential of the town during the next several decades and the massive developments in the region it would appear mandatory that in order to achieve our objectives, knowledgeable and decisive leadership will be required.

6.6.3 Government Assessment

Within the provincial government, departments and divisions are established on a variety of bases: natural resource base, natural

resource use, geography, function, etc. Probably the most idealistic form of administration would be regional administrative units based on a specific geographic or morphologic basis which would provide integrated government programs to the region. However, because of the current heterogeneous administrative structures throughout government, the legislation that creates them and the policies and programs which they administer, it is doubtful whether the administrative objective can be easily achieved. There are two alternative courses which could be attempted:

(a) modified structural rearrangements to achieve the necessary coordination at the provincial and regional levels

(b) a specially designed structure to complement existing government during the formative development periods to achieve the objective.

6.6.4 External Constraints

Based on the local reaction to date, it would appear that the following strategies would be acceptable.

6.6.5 Administrative Strategies

The following strategy is suggested:

6.6.5.1 Regional development of the Athabasca Tar Sands has all the elements of normal government administration in any part of the province with the following exceptions: First, it is approaching a period of intensive development and population growth which will probably outstrip the local administrative coping capacity. Second, this development consists of two basic types arising from the tar sands development: (a) regional resource development stemming from mineral extraction and processing, environmental protection and reclamation, and subsequent land use and resource management, and (b) urban growth and all its social and physical requirements.

The relative weakness in the local communities ability to cope with strains associated with intensive socio-economic development and the significant inputs that will be required from the provincial government with respect to the resource development and associated urban growth both suggest that it is probably better to maintain the Fort McMurray-Athabasca region development within the provincial context but strengthen those three basic elements which make it exceptional from the balance of the province: (a) local administration, (b) regional resource development and management, and (c) urban development.

Strengthening could take various alternative forms ranging from high to low concentration of authority. For instance, it would be possible to establish a single Athabasca Tar Sands Development Commissioner responsible for all government administration within the bituminous sands region and reporting to a single Cabinet Minister. However, a concept of administration embodying the concepts of dispersion of authority and the reliance on concensus appears to be more acceptable. This would mean adopting the structure similar to current structure found within government.

It is suggested that existing structures be strengthened at three levels: at the level of the Executive Council; at the level of senior provincial administrators; and at the regional administrative level.

Executive Council could be strengthened by expanding the Cabinet Committee on Natural Resources and Environment to include the Ministers responsible for Northern Development and Municipal Affairs on matters pertaining to the Athabasca Tar Sands. Thus, an Athabasca Tar Sands Development Cabinet Committee could consist of:

(1) The Minister of Federal and Intergovernmental Affairs (Chairman)

(2) The Minister responsible for Northern Development

(3) The Minister of Municipal Affairs

(4) The Minister of the Environment

(5) The Minister of Lands and Forests

(6) The Minister of Industry and Commerce

(7) The Minister of Mines and Minerals

At the senior administrative level the Natural Resources Coordinating Council, the Provincial Planning Board and the Conservation and Utilization Committee are the main operational interdepartmental committees. It is suggested that either could be used as a base for establishing a Policy and Planning Group on Athabasca tar sands development. This group would be responsible to the Cabinet Committee and its functions would include information exchange, coordination and policy planning requirements at the administrative level. Its membership should include representation from at least:

(1) The Department of Municipal Affairs

(2) The Department of the Environment

(3) The Treasury Department

(4) The Department of Federal and Intergovernmental Affairs

(5) The Department of Lands and Forests

(6) The Department of Mines and Minerals

(7) The Department of Industry and Commerce

(8) Industry

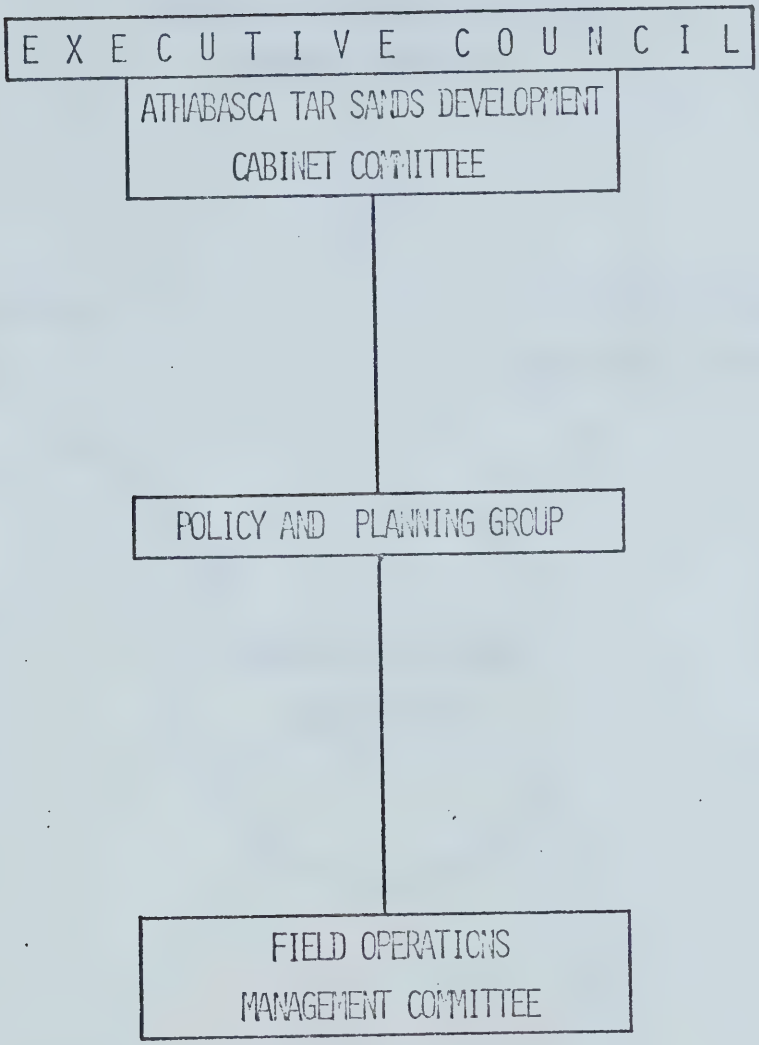
Initially this group should have a full time planning group seconded to it from the various planning divisions. It would be responsible for the preparation of the operational regional plan

arising from the overall development strategy of government. Representation from industry on the Policy and Planning Group on the Athabasca tar sands development should be considered.

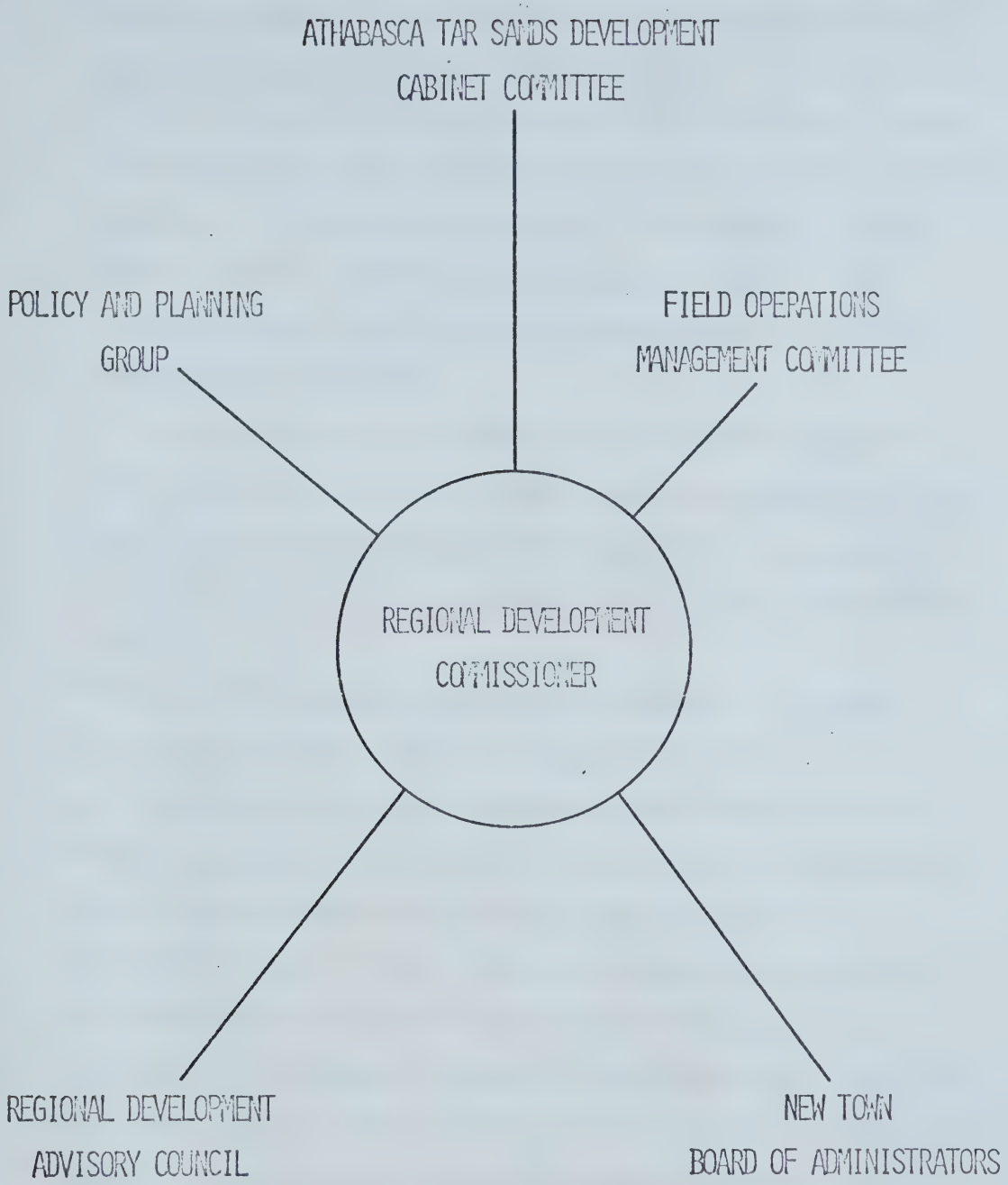
The regional field staff level requires considerable strengthening, both in manpower and coordination. A first step would be to ensure that each appropriate department had a senior field staff position designated for the Athabasca tar sands region. The second step would be the establishment of the Field Operations Management Committee comprising of all the departmental field representatives. Their function would be to coordinate and integrate their activities with one another in order to provide a unified government service to the public.

The integration of these three levels; the political, the provincial administrative and the regional administrative with the regional social and business community and the Fort McMurray town administration is probably the most critical but least developed element.

In order to provide the necessary integration at a regional level the establishment of a Regional Development Commissioner's office should be considered. The Regional Development Commissioner and two special assistants would be responsible to determine what action was required to maintain policy implementation and promote its implementation through the responsible regional field staff. In this respect he would be guided by the directions he received from his political superior, the Fort McMurray Regional Advisory Committee, the Fort McMurray Board of Administrators, and the appropriate provincial level administrators and their regional staff. In the case of conflict his power would be in his direct contact with his political superior for a government decision and directive.



INTERDEPARTMENTAL COORDINATING STRUCTURE



SPHERES OF INFLUENCE

This would not be an administrative function, but it would be one of monitoring, evaluating, coordinating, integrating and expediting decision making for reference to the government. Its purpose would be to ensure program consistency with the overall objectives, strategy and policies and to bring anomalies or exceptions to the government's attention for correction or redirection. The purpose of the two special assistants would be to provide special expertise and assistance in the areas of urban development and regional resource development and management.

The proposed structure is not a super department imposed on other departments but rather a regional systems integrator providing lateral integration within a specified geographic region resulting in a bridging of functions and administrations into a comprehensive matrix.

Much of the current uncertainty at provincial or regional administrative levels rests not in the question of how to do it but on what should be done. Consequently when Executive Council chooses a strategy and formulates their policies the administration will be able to address itself to the operational details of implementing them. In other words, much administrative indecision has arisen from inadequately articulated government policy.

6.6.5.2 Acceptance of the suggestion should be predicated on the premise that the "commissioner" concept, although being dominant initially, should phase out over time, especially in the urban development areas as local and regional administrative capacity grows. For this reason the positions should be by contract and subject to annual review in order that they do not create a "dependancy effect" on the community.

6.6.5.3 The funding of urban municipal works may require special attention over and above The New Towns Act by consolidating the regional local property tax structure with Fort McMurrays to provide the necessary capital funds.

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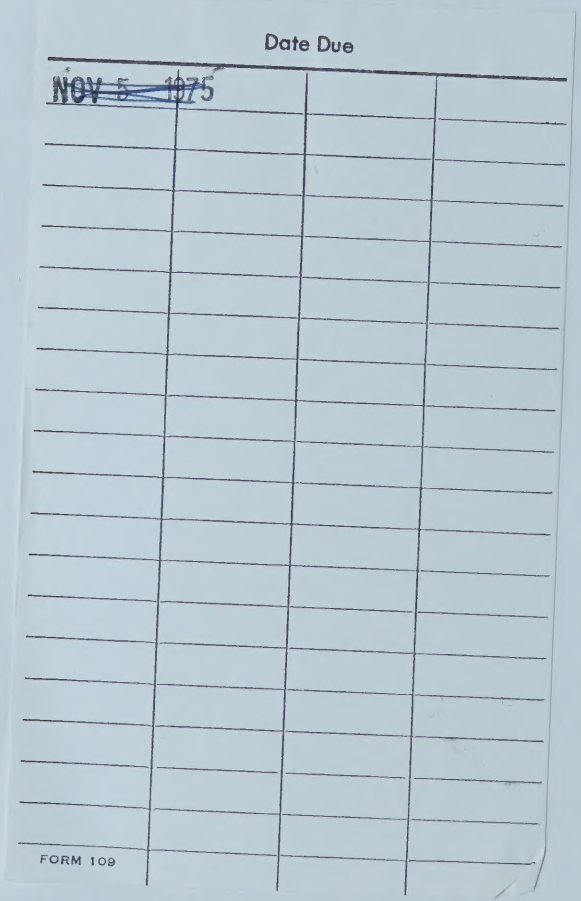

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